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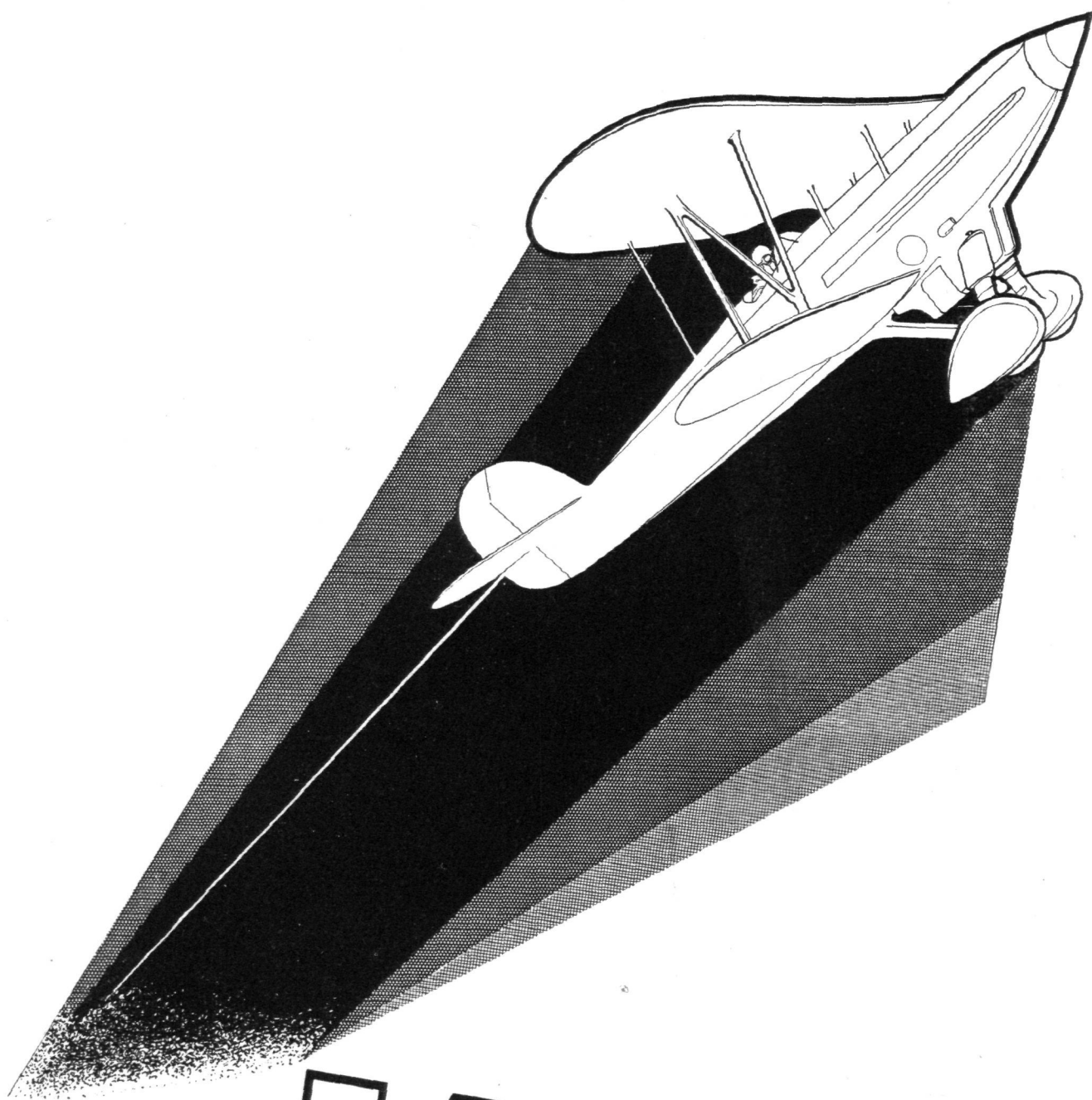
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Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice and Progress of Aerial Locomotion and Transport

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

No. 1304. (Vol. XXV.) 25th Year.  
No. 51.

DECEMBER 21, 1933

Weekly, Price 6d.  
Post Free, 7½d. Abroad, 8d.

Editorial Offices: 36, GREAT QUEEN STREET, KINGSWAY, W.C.2

Telephone: (2 lines), Holborn 3211 and 1884.

Telegrams: Truditur Westcent, London

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#### TO OUR READERS

The Editor reciprocates the many Greetings received by land, sea and air and offers his and the Staff's Best Wishes for Christmas and the Coming Year.

#### EDITORIAL COMMENT



CAPT. TYMMS, M.C., Director of Civil Aviation in India, is at last coming in to his own. He has lived through the depression when all schemes for civil flying had to be practically scrapped in the cause of economy. Now air transport in India is a very live interest. The first air mail for Singapore left Croydon on December 9, and should have arrived by the time this issue of FLIGHT has been published. The first homeward mail is to leave Singapore on December 31 and is due in London on January 10, 1934. With Singapore the responsibility of India ends, and that of Australia commences. India is now free to turn to the important subject of feeder lines.

India  
Calls for  
Speed

In our last issue we gave some account of a programme of air expansion which Capt. Tymms outlined for the benefit of the Indian Railway Conference at Simla. It is an extremely interesting programme. There are two companies which operate inland air lines in India, apart from the great trunk line which now runs from Croydon to Singapore. One of these is Indian National Airways, and the other is the Tata Air Lines, to which we have often alluded. Capt. Tymms mentioned three services which would be run by Indian National Airways: (1) between Calcutta and Dacca, (2) between Calcutta and Rangoon, and (3) between Karachi and Lahore. The first of these is a short line. Dacca is the principal place in Eastern Bengal, and was once the capital of the province known as

#### DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:—

1933.

Dec. 24. Close of International Rally at Cairo and Meeting of the F.A.I.

Dec. 28. Irish Ae.C. Annual Dance, Gresham Hotel, Dublin.

Dec. 29. Liverpool and Dis. Ae.C. Annual Ball, Grosvenor Hotel, Chester.

1934.

Jan. 11. "Testing of Aircraft Landing Mechanisms and Some Factors Affecting Design." Lecture by W. D. Douglas, before R.Ae.S.

Jan. 18. "Ethyl," Lecture by F. R. Banks, before R.Ae.S.

Jan. 19. Newcastle-on-Tyne Ae.C. Annual Ball, Barras Bridge Assembly Rooms.

Jan. 24. "Development of the Fleet Air Arm." Lecture by Wing Com. W. R. D. Acland, before R.U.S.I.

Jan. 30. Croydon Airport Annual Dinner and Dance.

Feb. 1. "Engine Cowlings." Lecture by J. D. North before R.Ae.S.

Feb. 2. Cinque Ports Flying Club Annual Dinner and Dance, Royal Pavilion Hotel, Folkestone.

Feb. 8. "Engines." Lecture by Capt. A. G. Forsyth before R.Ae.S.

Feb. 16. Bristol and Wessex Ae.C. Annual Ball, Grand Spa Hotel, Clifton.

Feb. 21. "Development of Aircraft and Its Influence on Air Operations." Lecture by Sq. Ldr. R. V. Goddard before R.U.S.I.

Feb. 22. Herts and Essex Ae.C. Annual Dinner and Dance, Wharnccliffe Rooms, Hotel Gt. Central, London.

Mar. 15. "Some Developments in Aircraft Construction." Lecture by H. J. Pollard before R.Ae.S.

Mar. 21. "Some Problems of a Technical Service." Lecture by Wing Com. G. W. Williamson, before R.U.S.I.

Mar. 29. "Results from the Compressed-Air Tunnel." Lecture by E. F. Relf, before R.Ae.S.

Apr. 27-May 6. International Aero Show, Geneva.

May 27. Deutsch de la Meurthe Cup.

Eastern Bengal and Assam, which was instituted by Lord Curzon when he was Viceroy. This so-called "partition of Bengal" was finally revoked, but Dacca remains an important spot, and a speedy link with Calcutta will be advantageous to it. The second of the services, Calcutta-Rangoon, is supplementary to the main trunk line, and will provide a connection on alternate days. The third service, Karachi-Lahore, is interesting, because the Director of Civil Aviation said that it would be for mails only, and also because the route to be followed presented some problems, owing to the North-West Frontier Province being a prohibited area for civil aircraft. The new service will, therefore, merely hurry the Home mails for the Punjab up to the provincial capital, Lahore, via the important district towns of Jacobabad and Multan. The mails are to be pushed through really fast. Capt. Tymms said that the aircraft used must have a cruising speed of 130 m.p.h. Of course, he did not specify what type of machine would be used, but the mind naturally turns at once to the Avro mailplane, which has recently been fitted with the Armstrong-Siddeley 600 h.p. "Tiger" instead of the "Panther," with great advantage to its speed.

The other service to be instituted is between Bombay and Calcutta, which Capt. Tymms said was destined to be the heaviest traffic-bearing airway in India. That is natural, as it would connect the two largest cities and most important centres of commerce in the country. From the report which we have received, it would appear that the Tata firm were expected to tender for this service. Did one not recognise that the depression accounted for many things, one would find it rather hard to understand why India did not institute a Bombay-Calcutta air mail years ago, without waiting for Imperial Airways to arrive at Karachi. There would have been a great advantage in connecting with the mail steamer at Bombay, and hurrying the mails across India to Calcutta. Now each year will see more and more of the mails arriving at Karachi instead of at Bombay, and the utility of a Bombay-Calcutta airway must be decreased accordingly. At the same time, one must confess that this route was one which had to await the production of the right type of aeroplane. It would have been useless to compete with the train until the aeroplane could cover the 1,050 miles in the daylight hours of an Indian day (which is not nearly so long as an English summer day), or, failing that, could fly by night. Even now it is not certain that the British aircraft industry has produced a machine which will fulfil Capt. Tymms' requirements. He stipulates for a mail-carrier which has a normal cruising speed of 175 m.p.h. with a load of 1,000 lb. of mails, and an endurance of 1,250 miles. The Boulton and Paul mailplane came within the class indicated by Capt. Tymms, and a second machine, modified in the light of the experience gained by the first, might well fulfil his requirements, and perhaps a bit more. The service contemplated is to be daily, and it is estimated that five mailplanes will be required to keep it going.

It is extremely interesting to see India, the East which Kipling said it is fatal to hustle, demanding cruising speeds of 130 and 175 m.p.h. It is very healthy to get these demands from the Dominions. It wakes us up. It is not that our aircraft industry is exactly somnolent, and it is not that it is in any way incapable of supplying the demand. The fact is that hitherto it has not seen any sufficiently great demand for such speed as compared with other characteristics. Now a definite demand comes from India. At present it is only a demand for a moderate number of aircraft, but it is a presage of more to come. The possibilities of India are not unlimited, but they are great. One of the limitations of India is that there are now, and probably in the future will be, only a small number of persons in the country who can pay for high speed as passengers. Mails, however, already demand speedy transport, and this demand will certainly grow. The programme outlined by Capt. Tymms is only a beginning, and it still leaves many places of importance without an air mail delivery.

We cannot consider the situation satisfactory until we are able to name many more than two types of British aeroplanes which can satisfy the speed demands of India. We sincerely trust that because Capt. Tymms said that the Bombay-Calcutta service would only call for about five machines, the Trade will not say to itself that India is not worth considering. India may only need a few aeroplanes at present, but she will need many more before long, and the firm which gets in on the ground floor of the Indian market should in the future reap a satisfactory reward.

\* \* \* \*

The inquest on Flt. Lt. J. B. Allen, pilot to the Duchess of Bedford, who was killed when flying after dark a few days ago, strongly suggests that the accident was due to the pilot suddenly finding himself confronted with a pylon of the

**That Grid** electricity grid, and losing control of the machine in a sudden turn to avoid it. If that be the case, then the death of a fine pilot must certainly be put down to the debit account of the grid, and, what is more, unless something is done quickly the grid will be the cause of many more deaths.

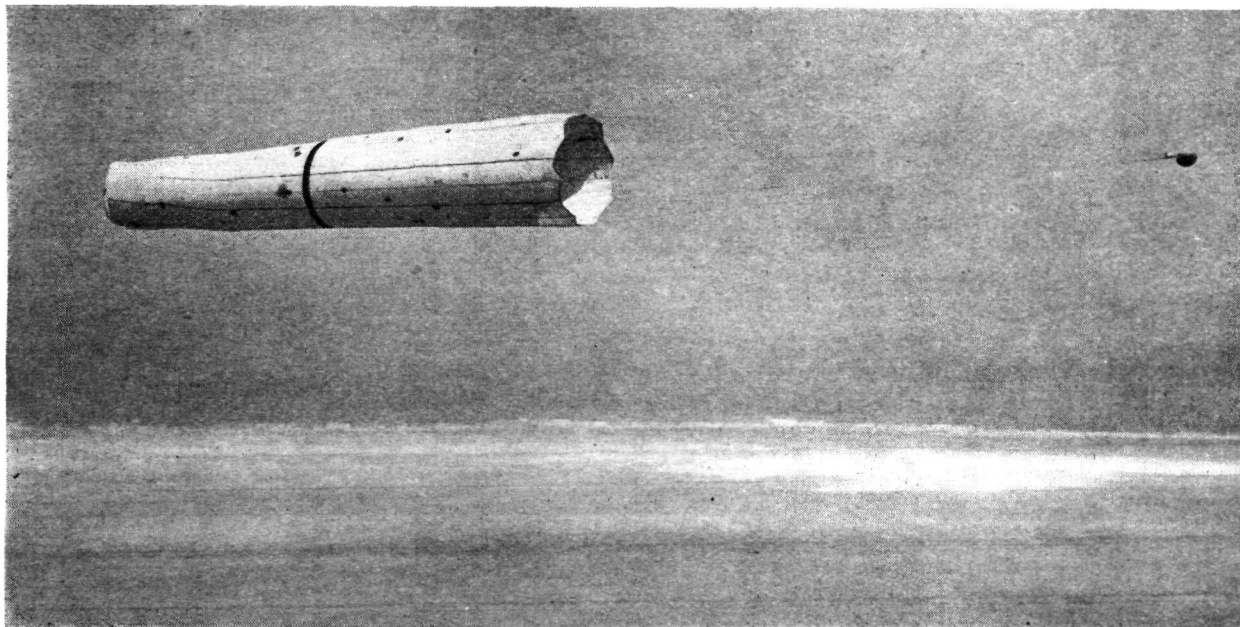
In the last report on Civil Aviation in this country, it was mentioned that the Air Ministry had had under consideration three methods of lighting the cables at specially dangerous points. One was by attaching neon tubes to the cables themselves, which was rejected as unsatisfactory. The second was by indirect lighting from a projector lamp about 25 ft. away from the base of the pylon, which was under consideration at the end of the year, and the third was by hanging lamps on lattice masts of the same height as the cables. Naturally, this last scheme was estimated to be very expensive.

Now that civil flying is increasing so fast the problem is likely to become very serious, and it is high time that lighting of the pylons should be undertaken with equal seriousness.





*This week we strike a new note in our series of articles on R.A.F. stations. Armament training camps are peculiar, and are seldom seen by the ordinary tourist, as, for reasons of safety, they are mostly situated in sparsely-inhabited parts of the country. However, representatives of FLIGHT have penetrated to one of these camps, and the following article tells of what they saw there*



THE DROGUE TARGET: This target is of the same size as the fuselage of a "Bulldog," and is towed behind a "Gordon." (FLIGHT Photo.)

## North Coates Fitties

### No. 2 Armament Camp

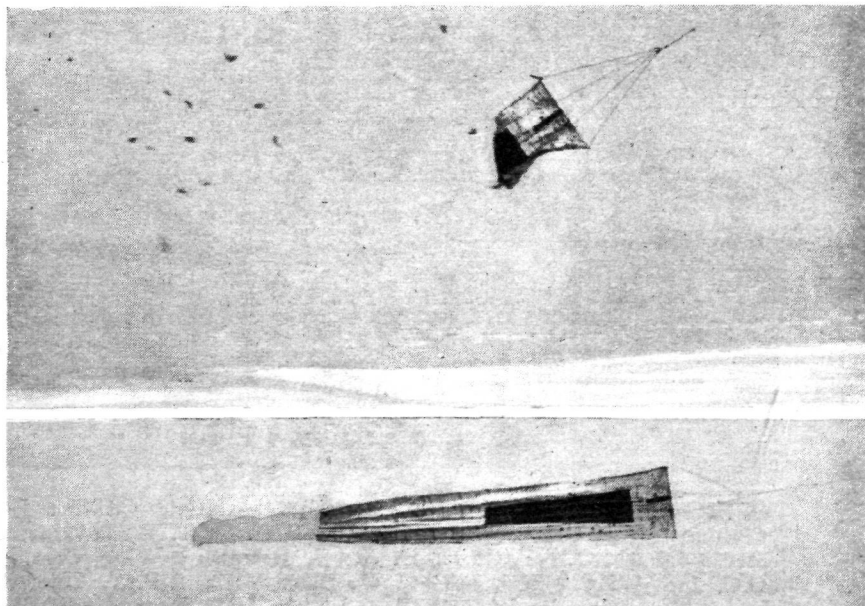
By MAJOR F. A. de V. ROBERTSON, V.D.

**N**ORTH COATES FITTIES! Is it not an intriguing name! It makes one want to get out histories and find out why the place was so called, what its origin is, and what may be its meaning. It smacks of Anglo-Saxon, but we can go no further than that. Perhaps some reader who is learned on the subject of Lincolnshire place-names will be able to enlighten us. And to think that but for the Royal Air Force this name of names might have remained buried in the obscurity of the Lincolnshire fens!

The Royal Air Force was driven to dive into the obscure, not from a natural love of the picturesque and mysterious, but from the need to find spots where bombs could be dropped and machine guns fired without risk to the persons of the King's lieges. It was the desolate which attracted the rulers of the R.A.F., and so they naturally explored the coast south of the Humber's mouth. There they found many places with delightful names unknown to the great British public. North Somercotes and South Somercotes suggest the same origin as North Coates Fitties. Near

by, on the coast, is Donna Nook—can that have any connection with the Spanish Armada? At any rate, Donna Nook has an intimate business connection with North Coates Fitties, which seems most appropriate.

In all, three places were chosen for bombing and firing, the other two being Catfoss in the East Riding of Yorkshire, and Sutton Bridge, near Wisbech in Cambridgeshire. At each of these places there is an Armament Training Camp. Camp is the right name for what one finds at



THE FLAG TARGET: The flag is taken up packed in a case in the "Gordon," and is released in the air. The top picture shows the flag unfolding, with clots of sand which had got inside the case flying round it. The lower picture shows the flag in vertical position for gun practice. It can also be towed in horizontal position. (FLIGHT Photos.)



**GROUND TARGETS :** A line of targets for preliminary gunnery practice is laid out along the wet sand, and a "Gordon" is firing at them. Note the shadow of the machine. (FLIGHT Photo.)

have seen the tail skid of a "Gordon" go right under, and I began to wonder if the whole machine would sink below the surface, when half a dozen stalwart airmen dashed forward, effected a gallant rescue, and lifted the tail to safety on the grass.

The camp is quite a charming place on a sunny day, but in winter I can imagine that it might be a bit drear. The squadrons do not visit the Armament Training Camp in winter, and so everyone packs up and goes off elsewhere. The permanent civilian adjutant and a small staff remain in charge. Each spring a new commanding officer and armament staff are appointed. The camp opens on March 1 each year and closes at the end of October. The camps were first started in 1927, and then remained open for only one month, but that proved quite inadequate, and so now they remain open for eight months. In that period all the squadrons in the country visit one or other of them, and in addition all the squadrons or flights of the Fleet Air Arm and the regular personnel of the Auxiliary Air Force squadrons. The Army Co-operation squadrons usually open the ball and distribute themselves among all three camps in March. Then the camps are allotted to certain classes of squadrons. In 1933 the night bombers went to Catfoss, the fighters to Sutton Bridge, while the day bombers, the Fleet Air Arm units and the regular elements of the Auxiliary Air Force all went to North Coates Fitties.

In addition to its aerodrome, the camp has rights over a large stretch of the foreshore, in all about  $7\frac{1}{2}$  miles from Donna Nook beacon southwards, and extending for

North Coates Fitties. It is a hutted camp, and everything except the aircraft is housed in wooden huts. There are quarters, messes, a hospital, and a N.A.A.F.I. The aeroplanes live in Bessoneaux hangars. There is also an aerodrome. It is quite a good aerodrome, and the surface is nice and hard, except on the tarmac. On a hot day I

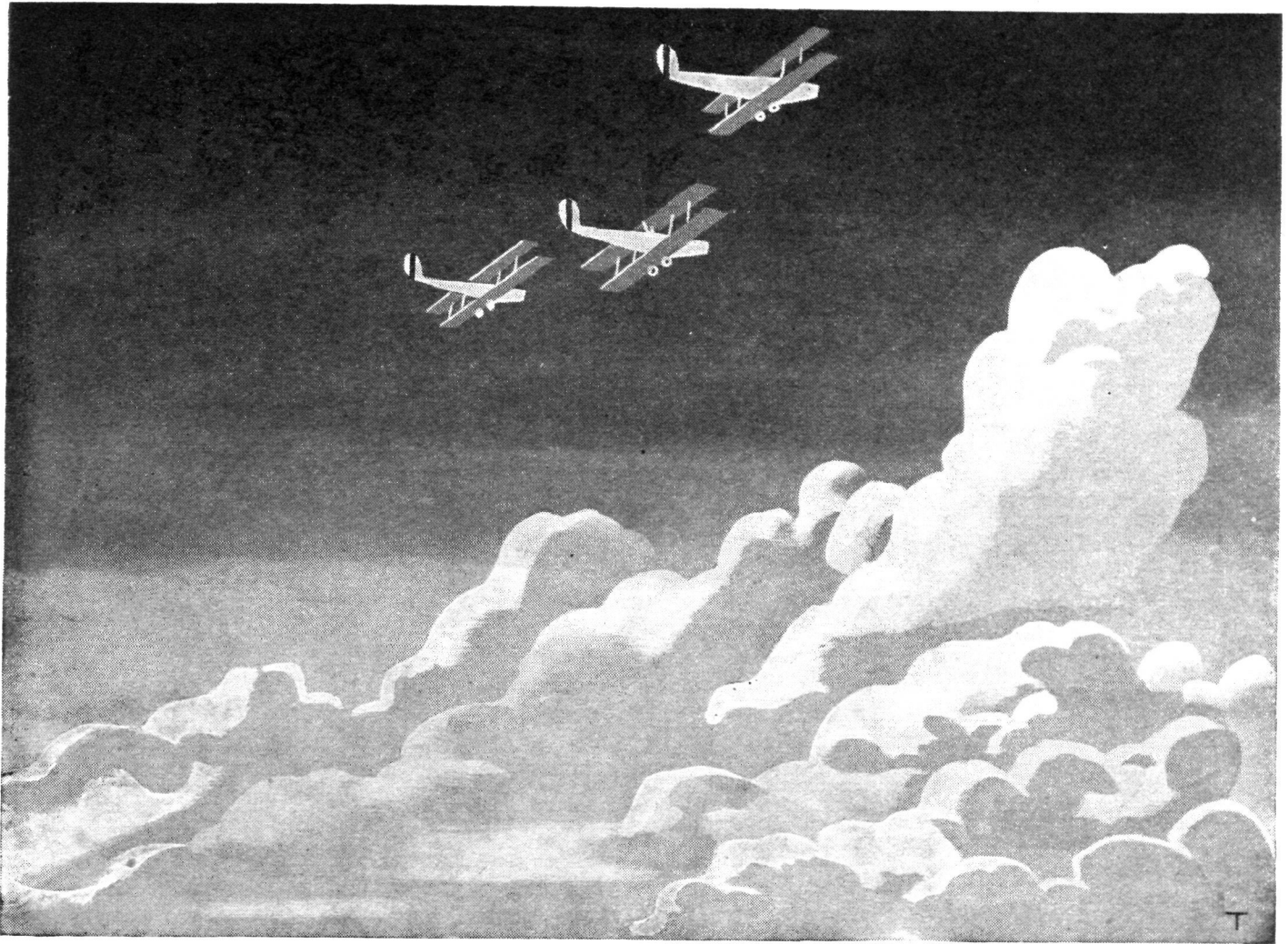
some 8,000 yards out to sea. It is a very shallow, sandy foreshore, and when the tide is out there are miles of wet sand.

This makes an ideal place for bombing and air firing. Our photographs show the great expanse of sand, with bombs falling and exploding on it.



**OFFICERS OF NO. 2 ARMAMENT TRAINING CAMP :** Left to right—Mr. J. F. Mehigan, Civilian Stores Officer and Adjutant ; F/O. C. R. J. Hawkins, O.C. Station Flight ; Flt. Lt. L. P. McCullagh, M.O. ; F/O. C. E. St. J. Beamish ; Wing Com. J. W. Woodhouse, D.S.O., M.C., O.C. 2nd A.T.C. ; Sqd. Ldr. C. W. Busk, M.C., A.F.C., Chief Armament Officer. Sportsmen will recognise in F/O. Beamish the Irish International forward. (FLIGHT Photo.)





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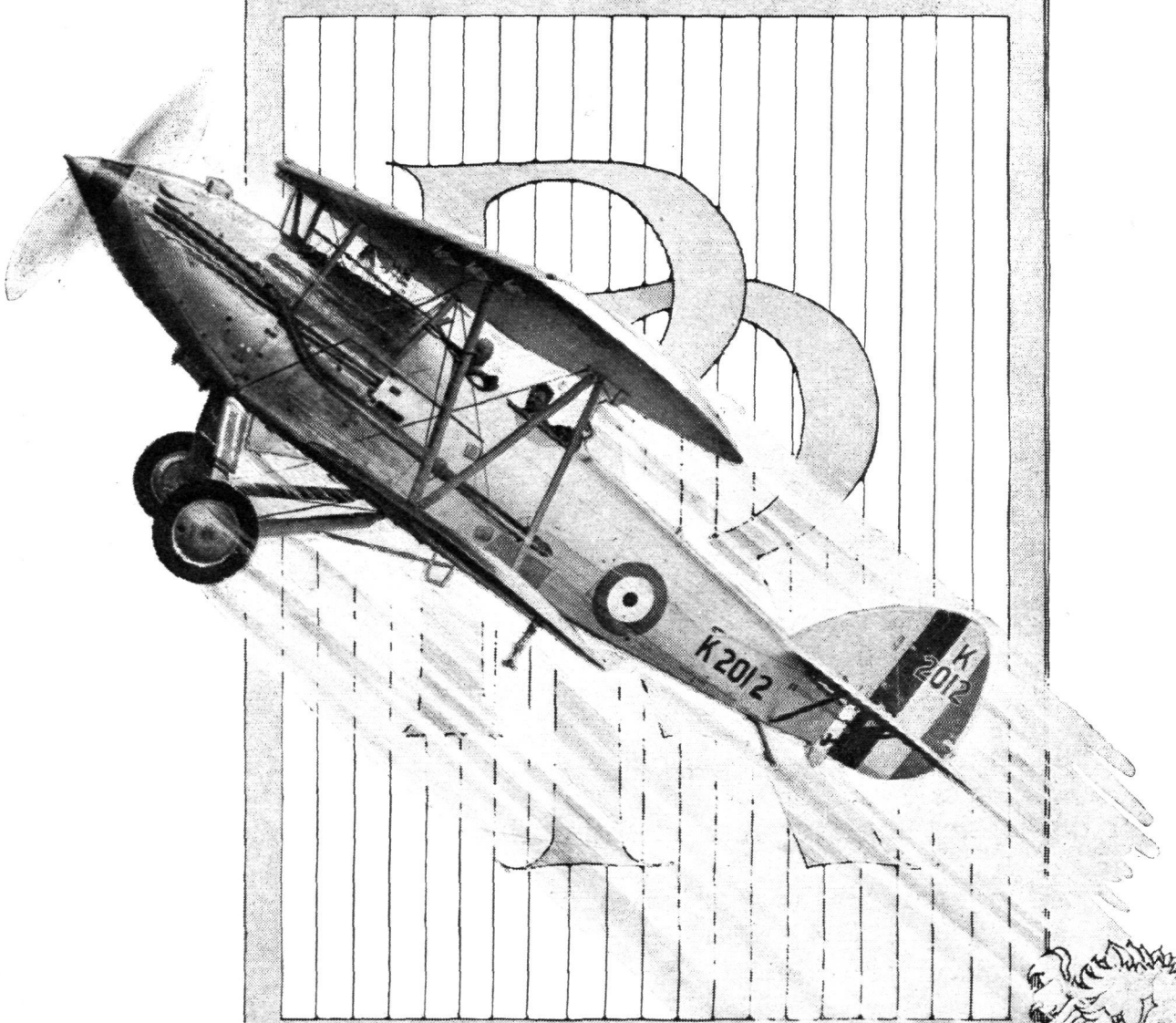


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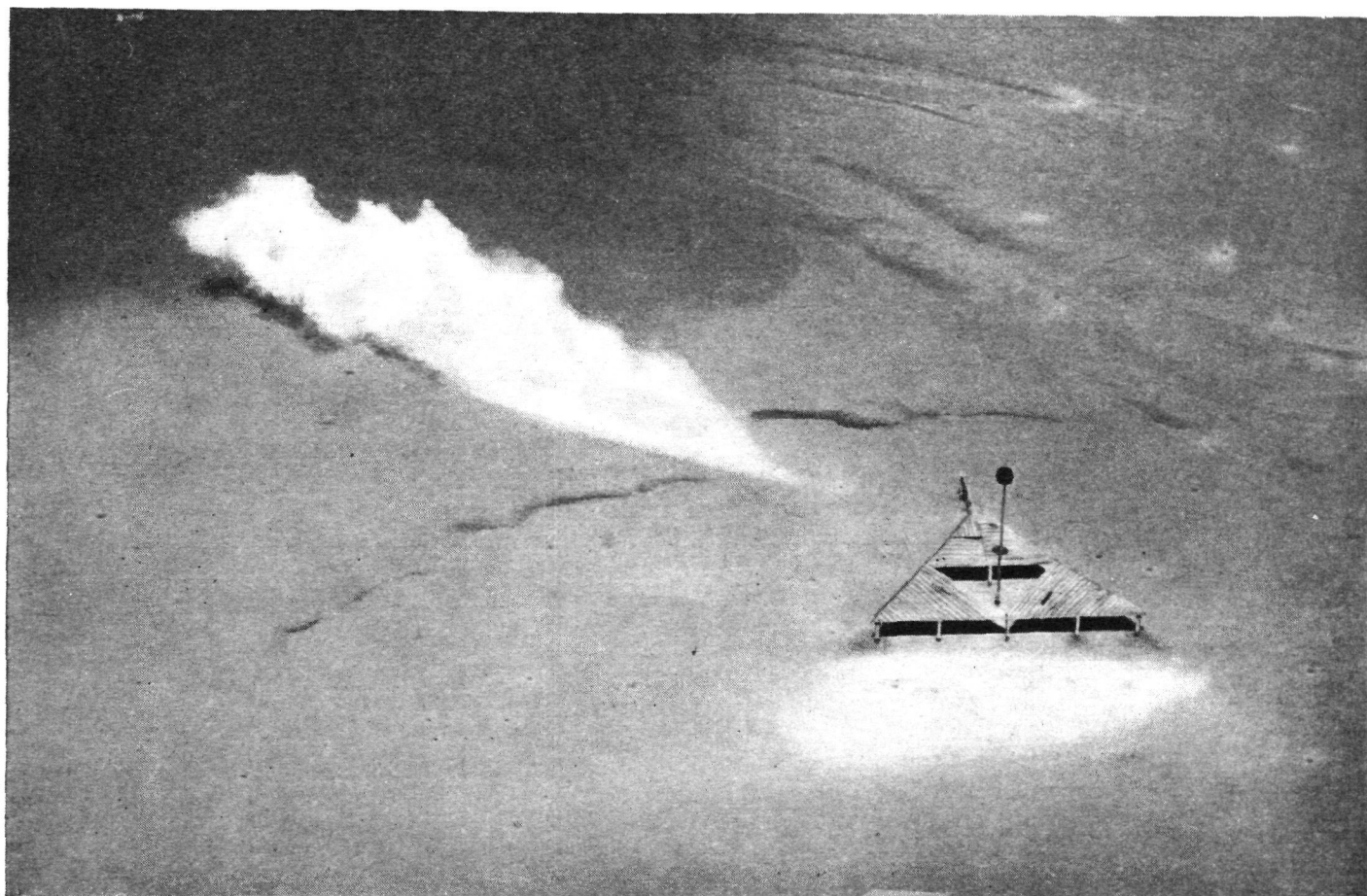
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**A BOMBING TARGET :** Bombing targets are laid well out to sea, but when this photograph was taken the tide had gone out. A practice bomb is bursting near the target—quite a good shot. (FLIGHT Photo.)

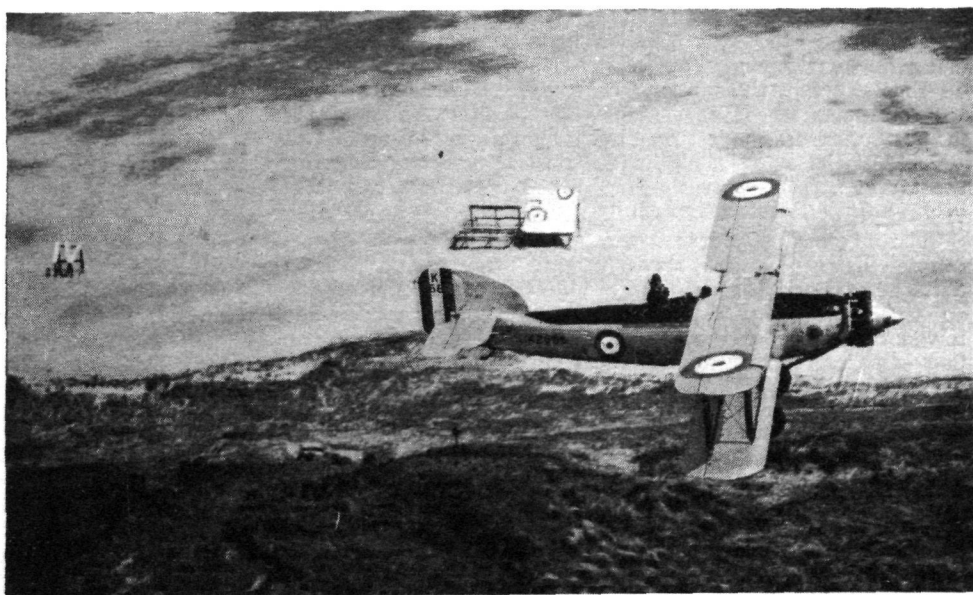
#### Bombing Practice

On this area of sand there are three bombing targets and 10 targets for air firing. Two of the former are used for sub-calibre bombing, and one for live bombing. Sub-calibre bombing means using 11½ lb. practice bombs, and it is carried out from various heights up to 14,000 ft. Standard bombs are used for the live bombing, and their types vary according to the type of aeroplane which is carrying out the practice. The larger sizes of bombs are filled with sand instead of with high explosive, so as not to disturb the equanimity of the natives. The sub-calibre bombing targets which are shown in our photographs are triangular wooden frames with sides 64 in. long, and in the centre is a basket mounted on a pole. These targets are about 1,000 yards out from the beach. The most southerly target can be illuminated at night, for the night bombers from Catfoss come over at times on long-distance tactical exercises. This target is lit up at night electrically, the switch being put on by a solenium cell when the light fades. The marking is done at night by a quadrant and also by photograph.

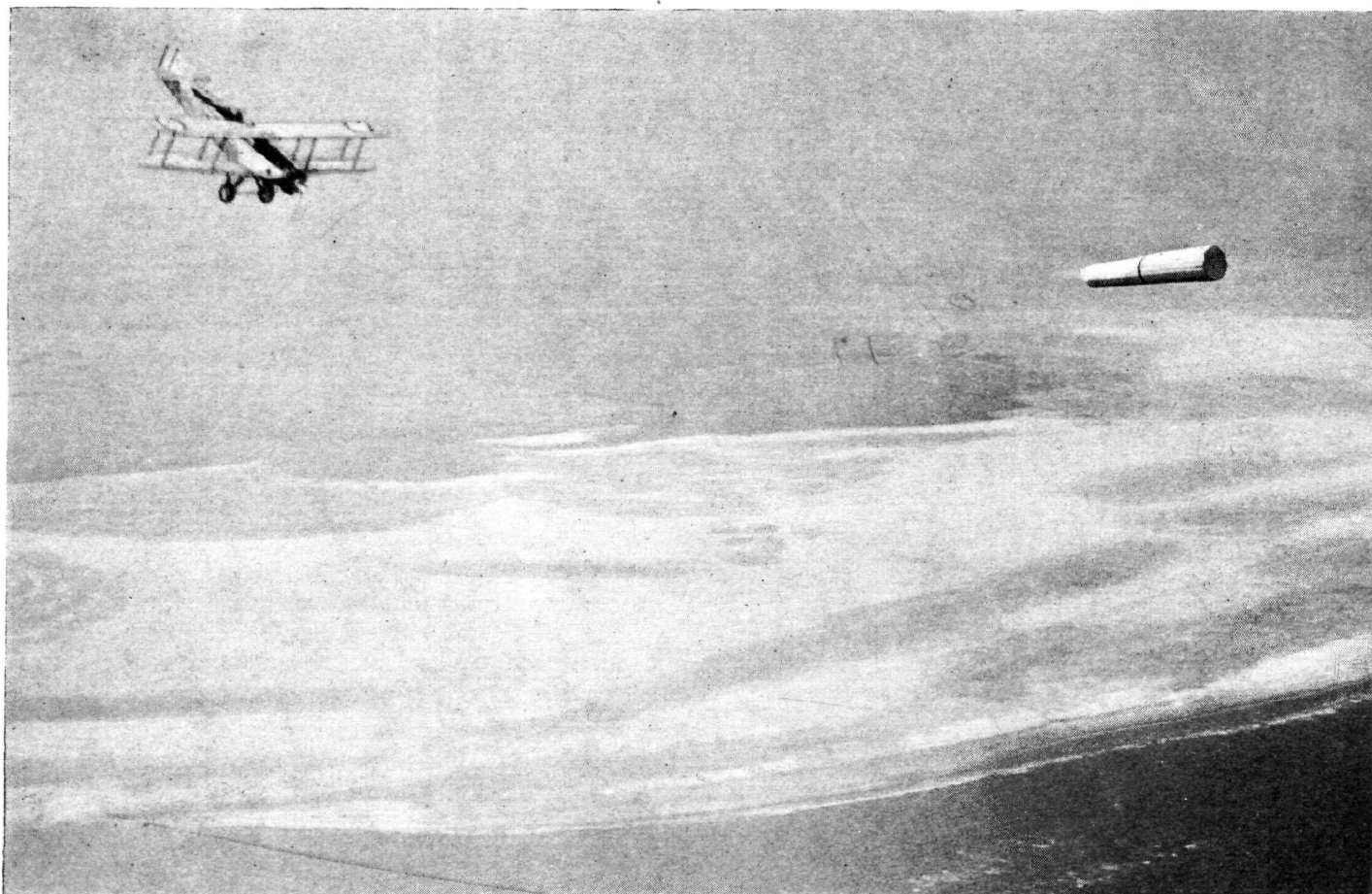
The target for live bombing is a ring buoy, and is situated farther out from the beach. The marking or scoring is done by quadrant spotters, and there are five quadrants on the coast. By taking bearings on the explosion from two different points, the fall of the bomb can be plotted out quickly and accurately. The camp is 12 miles away from the range, so eight N.C.O.'s and 24

men live down by the range in huts, while an officer goes out to the range every day. After a bombing practice, the results are rapidly plotted, and are available at the camp before the pilot lands. Then his practice is discussed with him while every release is fresh in his memory, and he can give reasons for everything he did and see for himself whether the result was a success or not. This is considered a very important point. It would be little use to discuss a practice a long time after, when the pilot had forgotten all about it.

There are usually two squadrons at the camp at one time, but sometimes only one. The period of the stay varies, according to the type of aircraft, but the usual period is about a month. The programme of bombing and air firing is drawn up by the Air Ministry. This programme includes some long-distance raids, and the day bombers from North Coates Fitties return by day the visits which the night bombers from Catfoss pay them by night.



**GUNNERY TARGETS :** The "Gordon" is flying past the line of ground targets (which are covered with old aeroplane fabric) and the rear gunner is firing at target No. 4. (FLIGHT Photo.)



**FIRING AT THE DROGUE :** When a gunner has proved himself at the ground targets he is allowed to fire at targets in the air, and his merit is rated by his success at this practice. (FLIGHT Photo.)

#### Air-Firing Practice

The other part of the work at North Coates Fitties concerns firing machine guns from aeroplanes. In a day bomber both the front gun and the rear gun have to be taken into account. The old method of practising machine gun firing from the air was only to fire at ground targets. During the war, before armament camps had been properly organised, it was a common practice for pilots to dive at a pond in a field, firing as they dived. This sometimes resulted in their getting their machines past the vertical, and as some of the fighters of those days were automatically stable when flying upside down, an inexperienced pilot could not always recover from this position, and the results were sometimes disastrous. In any case, firing at an immovable target on the ground was very insufficient preparation for firing at a moving enemy aircraft in the air.

At the armament camps each pilot starts his gunnery course by firing at a ground target, and one of our photographs shows the rear gunner in a Fairey "Gordon," using his machine gun on targets which lie in a line just off the beach on the range. There are 10 of these targets, and each has its number displayed beside it. The target in our photograph is No. IV. The actual targets are covered with old fabric off aeroplanes, hence the rings on the target in the photograph, which do not indicate bull's-eyes, magpies, etc., as might be supposed.

When the pilot and the rear gunner have proved themselves efficient at the ground targets, they are turned on to targets towed through the air, and it is the score made on these air targets which counts in the course. The towed targets are of two kinds, a flag and a drogue. The flag is flat, but can be towed in either a horizontal or a vertical position. The towing is carried out by one of the machines of the Station Flight, which is possessed of three "Gordons" and a "Moth." The towing is done by one of the "Gordons," which carries three targets. These are broken one at a time. The cable is a Bowden type stranded wire, and the target is generally released to about 1,000 ft. behind the "Gordon," which flies round in a large circle, so that the machine is never in a direct

line with the target. When a practice at one target has been completed, the "Gordon" flies over Donna Nook and drops the target, and then releases another without having to land. The second type of target is called a drogue, and resembles the ordinary wind-stocking which is flown at every aerodrome. It is of the same dimensions as the fuselage of a "Bulldog." One of our illustrations shows the front gun of a "Gordon" firing at a drogue. More than one practice can be carried out at the same flag or drogue before it is dropped. The bullets used in the different practices are smeared with paint of different colours, and a trace of the colour can be seen clearly round the hole in the target, so that the shots of the different practices can be distinguished when the target is dropped. Short of having an aircraft controlled by wireless, or a glider released from an aircraft, as is the practice at Gosport for naval gunnery practice, this method of firing at a drogue is perhaps as good as any could be for training pilots and air gunners to hit enemy aircraft in the air.

It is the opinion of not a few pilots who did a lot of fighting in the last war, that in those days not nearly enough attention was paid to marksmanship. The general rule was: Hold your fire until you are so close that you can't miss. Baron von Richthofen often speaks of British pilots starting to fire too soon, which he regarded as a sign of nervousness. He never felt any fear of such fire, and it always gave him confidence that the British machine would fall an easy victim to his great experience and skill. Just occasionally one heard tales of someone who was an expert shot in the air, and would shoot down his "Hun" from an unexpected distance. It is one of the objects of the armament training camps that in future no pilot and no gunner shall go into action without sufficient practice in firing at an air target. This sedulous practice may save us many losses and bring us many victories if ever again our Royal Air Force has to meet an enemy in the air.

*Note.*—For list of previous articles published in FLIGHT dealing with R.A.F. Squadrons, see page 1299.





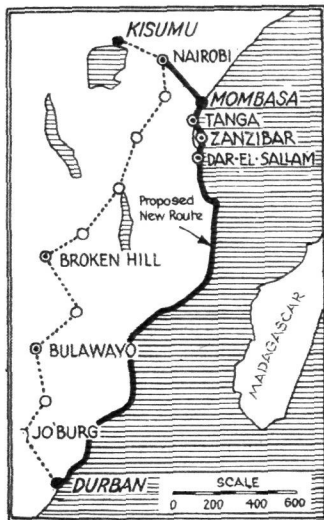
# Air Transport.

## A COASTAL AIR SERVICE FOR AFRICA

A COASTAL flying-boat service between Mombasa and Durban is contemplated by Imperial Airways. A party led by Maj. H. G. Brackley, Air Superintendent of the company, has recently surveyed the route in a Short "Calcutta" biplane boat, and there is every likelihood that regular operations will begin soon. Major Brackley, who was accompanied by Mr. C. G. Lumsden, pilot, and by Mr. J. W. S. Brancker, who was recently appointed to the management of the company's Central African Area, has prepared a report on every mile of the way, indicating the best and safest anchorages for craft of the size of the three-engined "Calcuttas," and the amount of traffic which might possibly be diverted from the present slow coastal steamers to an airway. Though the coastal service would be run as a separate undertaking, an air link would be provided to the main trunk line at Kisumu, whence to the coast the flying-boats would follow the line of the great lakes. First multi-engined flying-boat to be employed by Imperial Airways on the Empire routes, the Short "Calcutta" was displaced two years ago in the Mediterranean by the larger four-engined Short "Scipio" machines. Subsequently, they were employed up to the spring of this year on sections of the Africa airway as far south as the great lakes. Others have acted as reserve equipment to the Mediterranean services. Each "Calcutta" has space for up to 14 passengers and a considerable load of mails and freight. A service of the kind proposed would employ them profitably for some years yet, and at the same time provide enormous saving of time for all urgent communications along some 2,300 miles of coast.

## JERSEY AIRWAYS, LTD.

A LIMITED company named Jersey Airways, Ltd., with a nominal capital of £20,000, has been registered by the Jersey Royal Court. The objects of the company will be to establish an air service between Jersey and England. The company's D.H. "Dragon" flew from Portsmouth to Jersey on Friday, December 15, in 54 minutes. The object of this flight was to make sure that when the regular service was put into operation on the following Monday there would be no "hitches." Three directors of the company, Messrs. W. L. Thurgood, L. T. H. Greig and Mr. Sharpe were passengers on this flight. From Jersey alone the bookings to the end of the



month number nearly 80. To cope with the rush two "Dragons" have been borrowed from other companies, one from Brian Lewis, and the other from the Scottish Motor Traction Co. Ltd. The company will soon have more machines of this type of its own. The single fare between Portsmouth and Jersey is 32s. 6d. and the return fare is 55s. It was originally intended that only one trip should be made daily, but to cope with the large number of bookings there will be two. The Portsmouth municipal authorities are operating a bus service from Portsmouth station to the aerodrome. In Portsmouth the agents for the company are Ume, Shaw, Ltd.; the Jersey offices of the company are at 1, Mulcaster Street, St. Helier. If favourable progress is made more services may be started by the company.

## FULL LOADS ON INDIAN NATIONAL AIRWAYS' OPENING SERVICES

ON December 1 the Calcutta-Rangoon and Calcutta-Dacca services, operated by Indian National Airways, were successfully inaugurated and carried out according to schedule, and it is stated that prospects are very encouraging. On the first Rangoon-Calcutta service 12 passengers had to be refused, the aeroplane, a D.H. "Dragon," having its full complement on board. The Calcutta-Dacca service has also been operating with full loads. During a joyriding interlude at Rangoon, 60 passengers were carried for short flights, and another 490 booked flights for a future occasion.

## A NEW LATECOERE FLYING-BOAT

A LARGE passenger flying-boat, fitted with four 1,000-h.p. engines, is being built at Toulouse by the Latecoere Company. Seventy passengers will be carried, and with 9,394 lb. of fuel, the range will exceed 620 miles. The spring of 1935 should see the completion of the machine.

## NEW MACHINES ON THE VENICE-MUNICH ROUTE

THE Società Aerea Mediterranea has put some Savoia-Marchetti "S.71" machines on the Rome-Venice-Munich-Berlin service. The Venice-Munich leg of the service is flown at over 19,000 ft. during the crossing of the Alps. A cruising speed of 145 m.p.h. is maintained. The "S.71" is by no means a new type of machine, as it was described in FLIGHT in May, 1931. The version being used by the S.A.M. Company, however, differs from the prototype, in that it is fitted with three Piaggio "Stella 7" engines. The performance is as follows:—Top speed, 172 m.p.h. (with two engines, 147 m.p.h.); service ceiling, with full load, 13,255 ft. (with two engines, 10,500 ft.); the total useful load is 4,420 lb. Instead of the Piaggio engines, Walter "Pollux" or Gnome-Rhone engines of similar power may be fitted.

## SABENA EQUIPMENT

A DEWITTINE D.335 monoplane (three 650-h.p. Hispano-Suiza engines) has been ordered by Sabena. This machine will differ from the 332 ("Emerald") type in that it will have a larger cabin, accommodating 24



FOR THE JERSEY AIR SERVICE: The D.H. "Dragon," St. Aubin's Bay, which Jersey Airways, Ltd., have put into service between Portsmouth and St. Helier, Jersey.



passengers. A conditional order has been placed with the Caproni Company for a twin-engined low-wing monoplane (Gnome-Rhone K.14 880-h.p. engines) known as the 122 type. Of mixed construction, this machine is fitted with a retractable undercarriage, and, with 20 passengers, has an estimated top speed of 193 m.p.h. at sea level.

#### SUSPENSION OF ITALIAN SERVICES

THE following Italian services will be suspended during the winter:—*S.A. Avio Linee Italiane*—Rome-Milan from December 15 to January 16; *S.A. Aero Espresso Italiana*—Brindisi-Athens-Constantinople, and Brindisi-Athens-Rhodes from December 21 to February 22; *Società Italiana Servizi Aerei*—Fiume-Brioni-Venice and Portorose-Trieste-Zara from December 17 to January 14.

#### LONDON-DERBY-MANCHESTER-GLASGOW AIR SERVICE

INTERNAL air lines are slowly but surely spreading their net over Great Britain, and this week we have to record the formation of yet another new company. The name of the new company will be "The London Scottish & Provincial Airways," the Managing Director being Mr. S. Bell. Four services will be operated daily between Croydon, Derby, Manchester and Glasgow, and the machines to be used are Airspeed "Couriers" with "Lynx" engines. The starting capital of the company will be £50,000, very nearly all of which has been raised. The intention of the promoters is to start off at the beginning of March with a service from Croydon to Derby and Manchester, and after this has been flown for a short time to continue it to Glasgow. After about two years' running it is hoped that the company will be firmly established enough to be in a position to go to the public for additional capital to improve and extend their activities. Emergency landing grounds are to be laid out along the route. Five sites have already been inspected and negotiations are going forward for the acquiring of the land. Arrangements have been made at the towns concerned for cars to collect passengers, at their doors if desired, and transport them to the local aerodrome. Mr. Bell tells us that he has interested the Manchester and Renfrew aerodrome managements in the project, and Rolls-Royce are giving every assistance in the establishment of an aerodrome at Derby. The names of his co-directors he is not at present in a position to divulge, but one of them is a very well-known Midland engineer. Three pilots have been appointed, one of whom has had considerable experience on Canadian airlines and returned to this country not so very long ago. The Postmaster-General has been approached, and, of course, the usual formalities have been gone through with the Air Ministry. The promoters have also been in touch with the K.L.M. with the idea of

running a branch service to Hull from Derby, to link up with the K.L.M. projected service from Hull to Amsterdam. The business of this new company is at present being conducted from the offices of Mansbridge, Lund & Co., Chartered Accountants, 52, Grosvenor Gardens, S.W.1.

#### THE ANTWERP-BELGIAN CONGO CONNECTION

A REPORT from Paris states that a Franco-Belgian air agreement is ready to be signed. This relates to a regular service between Antwerp and Elisabethville over the following route:—Brussels, Paris, Marseilles, Algiers, Aoulef, Gao, Zinder, Tchad, Fort Lamy, Fort Archambault, Bangui, Libingue, Coquilhatville, Port Franqui, Luluabourg and Bukama. Later an extension will be made towards Madagascar. Three French military squadrons stationed at Bamako (French West Africa), Bangui (French Equatorial Africa) and Antananarivo (Madagascar), will be used in the operation of the new service. Up to the present these squadrons have performed only military duties, and for their new work their establishments will be increased. French West Africa at present possesses 30 landing grounds, 11 of which have hangars. In French Equatorial Africa there are 74 landing grounds, 30 having hangar accommodation. The expenses incurred by the operation of the new service, which include the cost of meteorological and wireless stations, will be borne by France, Belgium and the territories connected by the line.

#### GERMAN TRANSATLANTIC PLANS

At a recent conference it was stated by the German Secretary of State for Air, Herr Erhard Milch, that the cost of the catapult ship *Westfalen* has been about £18,100. The provision of "seadromes" would entail an expenditure of over £1,060,000. It was mentioned by Herr Milch that a Dornier flying-boat, capable of making non-stop the South Atlantic crossing, is under construction.

#### CAIRO-ASSUAN AIR SERVICE

A BI-WEEKLY air service connecting up Cairo, Luxor and Assuan has been started by the Misr Airwork Co., of Cairo.

#### AIR MAIL CRASH IN SOUTH AFRICA

THE first accident that has occurred on South African commercial airlines is reported from Durban. The mail machine from Durban to Johannesburg crashed on Thursday, December 14, near Eshowe, the pilot and three passengers being killed, the fourth passenger and the wireless operator escaping unhurt. It appears that the pilot was following the Tugela Valley route on account of bad weather.

## PRIZE DISTRIBUTION AT THE NORTHAMPTON POLYTECHNIC

ON Friday, December 15, the Northampton Polytechnic Institute held its annual distribution of prizes and certificates to students, and an address was given by Mr. F. Handley Page, who also distributed the prizes. The list of prize winners, incidentally, assumed the dimensions of a book of 32 pages.

In speaking at the Northampton, Mr. Handley Page was back on familiar ground, for he was one of the first lecturers on aeronautics at this institute, his weekly lectures ceasing about 1915, when work on military aircraft occupied all his time.

Speaking on this occasion, Mr. Handley Page remarked that by the time he had distributed the prizes he would almost have reached canonisation!

In his address he gave a general survey of the requirements of modern aviation, and methods of training would be students of aeronautics, stressing the need for simultaneous practical and theoretical training in order that higher and higher efficiencies might be aimed at, because this was the most important factor in the present world of speed.

"The trouble is," Mr. Page said, "that we are flying too slow." From London to Rangoon, the average speed of the air service was 28 m.p.h., while American services across the U.S. reached an average of 100 m.p.h.

The only thing which would pay for speed was the air mail. Four million sterling were spent by Europe (exclusive of Russia and Great Britain) in 1932 in subsidising air routes. This represented £16 per passenger. Government subsidies were linked up with national effort, and so

we got the demand for international control of civil aviation. What was needed was contracts for the carriage of mails. The economic pressure which would be brought to bear would then result in greater speeds.

All these points, he said, offered scope for the ingenuity of the aeronautical engineer, and afforded increasing opportunities in drawing-office, research, transport, navigation, wireless and other work.

Once a standard had been acquired, interest must not be allowed to diffuse along other channels; hence there was a need for the aero engineer to specialise, and to be supreme in his own particular work.

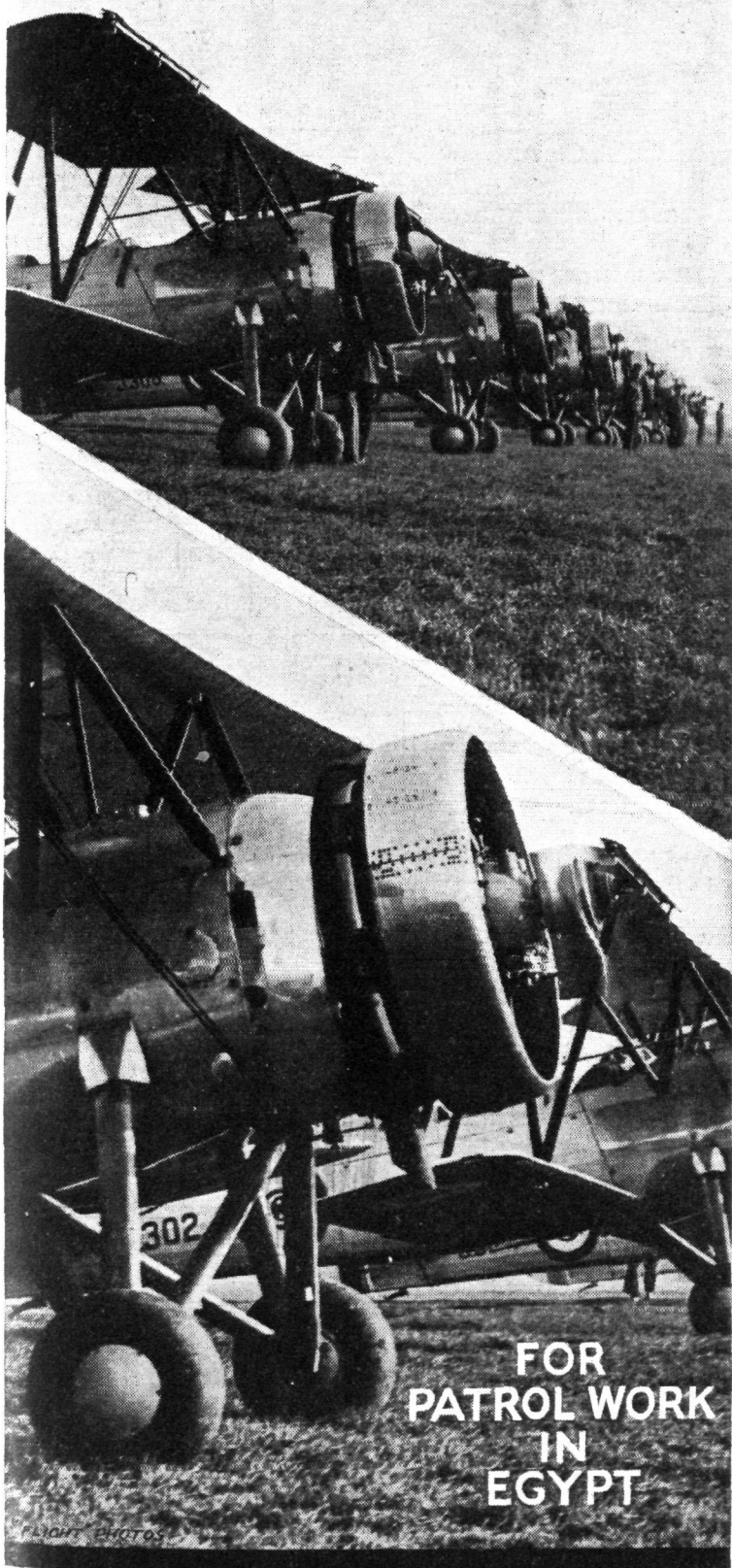
The proceedings opened with a speech by the Chairman, Mr. H. A. Game, and the Principal, Mr. S. C. Laws, gave a statistical report on the work done at the College during the Session 1932-33.

A vote of thanks was proposed by Mr. J. Crowlesmith, who complimented Mr. Page on "Having kept his head in the air and his feet on the ground."

After the meeting the laboratories and workshops of the Institute were opened to the public. The wide range of subjects exhibited gave a good idea of the thorough training which the students are afforded, and included:—Electrical instrument workshop, photometric laboratory, demonstrations; experiments and demonstrations of radio telephony and telegraphy; mechanical engineering workshops; aeronautics laboratory (spinning test in wind tunnel); forging and oxy-acetylene welding demonstrations and electro-deposition and fuels laboratories.

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*Extract from a speech by The Right Hon. Sir Eric Geddes, G.C.B., G.B.E., K.C.B., Chairman of Imperial Airways Ltd., at the Ninth Ordinary Meeting of the Company on October 30th, 1933.*

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# From the Clubs.

## THE LONDON AEROPLANE CLUB

Flying time for the week totalled 37 hr. 15 min. Mr. J. A. Lucas made his first solo flight, and the Hon. J. D. Carnegie his first solo cross-country. Messrs. P. H. B. Sprosen and A. H. W. Batten have completed "A" licence tests, and Mr. R. J. Waight has successfully done his night-flying test for a "B" licence. Mr. L. Reid is to be congratulated on a lucky escape when he spun into some trees on the edge of the aerodrome. Members are reminded that the Club will be closed for flying from Friday evening, December 22, until Thursday morning, December 28.

## HANWORTH (N.F.S.)

Messrs. Back and Walters, who are preparing for "B" licences, flew to Hendon to carry out tests, and were both successful. Mr. Tweddle, who joined the Club at the beginning of the month and took his "A" licence within a few days of joining, has carried out a cross-country dual instruction flight. Mr. Von Bahr returned from Sweden on Thursday, December 14, in Miss Reynolds' Redwing. Visitors during the week included Lord Grimthorpe and the Earl of Ronaldshay.

## CARDIFF AEROPLANE CLUB

Strong winds and thick weather reduced flying times to 1 hr. 15 min. dual, 1 hr. 5 min. solo, and 40 min. test. There was one first solo, Mr. G. E. Watkiss.

## BROOKLANDS

The flying times for the week have been considerably reduced owing to bad weather, only 35 hr. dual and 28 hr. solo having been flown. Mr. Ashton's navigation classes are proving very popular with new private owners. These lectures are divided into two sections, theory, which is given in the lecture room, and practice, which is given in the air. The Club and School will be closed from Sunday, December 24, until Sunday, December 31, but a skeleton ground staff will be kept on for the benefit of private owners.

## HERTS AND ESSEX AEROPLANE CLUB

The number of hours flown during the week was just under 30. Mr. Moss did a successful flight to Bristol and return for his "B" licence. Mr. Gordon Chapman is to be congratulated on his first solo. The usual Sunday evening dance is becoming very popular. The aerodrome and club-house will be closed on Christmas Day, and will be open again on Boxing Day, when a treasure hunt and Christmas Party will be held. Officials and members of the Broxbourne Club send their best season's greetings to all other Club members and the Civil Aviation Directorate, and trust that they will all have a very merry Christmas and a more successful flying year during the next twelve months.

## CINQUE PORTS FLYING CLUB

The Club's Annual Dinner and Dance will be held at the Royal Pavilion Hotel, Folkestone, on February 24, 1934. A first-class London orchestra has been engaged for the evening. Tickets, 17s. 6d. double and 10s. 6d. single, can be obtained from the Secretary. During the week Messrs. Lee and Popham were successful in passing their "A" licence tests. The Club will be closed from Friday, December 22, to Thursday, January 11, during which period the holidays will be taken and machines overhauled.

## THE LINCOLNSHIRE AERO CLUB

The Club has at present 170 members, of whom 14 are in training. Visitors during the week included the



## Death of Mr. S. E. Saunders, O.B.E.

WE very much regret to have to record the death on Sunday, December 17, of Mr. Samuel E. Saunders, O.B.E., president of the firm of Saunders Roe, Ltd. Though sea-craft were the great work of Mr. Saunders' life, he may also justly be called a pioneer of the aircraft industry. Born 77 years ago, he started work in 1871 in his father's boat-building works at Goring-on-Thames. Later he himself established works at East Cowes, Isle of Wight, which have become world-famous. Many of the yachts and motor-boats built there have also become famous. In 1912 Mr. Saunders co-operated with Mr. T. O. M. Sopwith in producing the Sopwith "Bat-boat," which was the first amphibian aircraft in the world, and also the second flying boat to be produced. In it the late Mr. H. G.

Earl of Warwick in a "Fox Moth," Sqd. Ldr. Brady in an Airspeed "Courier," Mr. D. L. Scott in a "Puss Moth," Mr. J. Scholes in a "Puss Moth," Mr. R. R. Bentley in a Comper "Swift," Capt. Davis in a "Moth," Mr. A. Shaw in a "Moth" and Mr. Henshaw in a "Moth." The annual dance was held on November 23 and was a great success, there being about 550 guests and members present.

## NORFOLK AND NORWICH AERO CLUB

The following have received instruction from Mr. Collier: Mrs. F. Crossley, Messrs. F. W. Rushmer, R. T. W. Ketton-Cremer and G. R. F. Clarke, and solo flights have been made by Miss W. Hudd, Messrs. F. W. Rushmer, W. M. Graham, A. J. S. Morris, A. Kirkby, S. Hansel and H. C. Stringer. Mr. W. Graham received some refresher dual and Mrs. Crossley did a cross-country flight to Bedford with an instructor. Mr. F. W. Rushmer, the winner of the scholarship presented by Mr. J. Hardy, is to be congratulated on a successful first solo. Applicants for the scholarship presented by Messrs. Edwardes and Holmes for their employers are still being tested, and it is hoped that the name of the successful candidate will be announced in the New Year. The Committee have decided as an experiment to allow the free use of the Club's tennis court to all new and present members of the Club; this does not, of course, include the cost of electric light. The Committee has further decided to reduce the Associate members' subscription to £1 during the rest of the financial year. This subscription and entrance fee entitles those joining the Club to the full use of the club-house.

## LIVERPOOL AND DISTRICT AERO CLUB

Flying has been seriously curtailed by bad weather during the past week, only 16 hr. 50 min. having been flown. The Club will be closed from Monday, December 25, to Thursday, December 28, inclusive. The Club will be kept open on Monday, January 1, but will be closed the following day, Tuesday. The Annual Ball will be held at the Grosvenor Hotel, Chester, on Friday, December 29.

## THE BRISTOL AND WESSEX AEROPLANE CLUB

During the week Messrs. T. G. N. Pearce, W. L. Stranger and F. Ashton White completed tests for "A" licences. On Wednesday, December 13, Mr. Robin Cazalet arrived at Bristol Airport from the Irish Free State in his "Monospar," and after clearing Customs left for Heston. The Club's Christmas Party, held at the Airport on December 16, was a great success, thanks to the organization of the Ladies' Committee.

## THE YORKSHIRE AEROPLANE CLUB (N.F.S.)

Bad weather reduced the Club's weekly flying time to about 8 hr. One solo flight was done by Mrs. S. P. Gardner. The December monthly dance, held at the clubhouse, was a great success, a most enjoyable evening being spent.

## DECCAN AERO CLUB

The rapid strides which have been made in aviation in the last year were clearly demonstrated recently at the Deccan Aero Club grounds, when large numbers turned out to witness the air display arranged by Mr. Babar Mirza, the founder of the Club. Joyrides were very popular, and many people availed themselves of the opportunity of seeing Hyderabad from the air. F/O. Mason, of the Madras Flying Club, gave a clever display of aerobatics, and Mr. Babar Mirza also gave a display.



Hawker won the Mortimer Singer prize by taking off from water, alighting on land, taking off from land, and alighting again on water. Mr. Saunders was responsible for the invention of "Consuta" plywood, which was afterwards used for the hulls of various flying boats. After the war his firm built the hulls of several of the Vickers flying boats and amphibians, including the "Viking," "Vulture," and several "Valentias." In 1927 he and Mrs. Saunders celebrated their golden wedding. In 1929 Sir Alliott Verdon-Roe and Mr. John Lord joined forces with Mr. Saunders, and the firm of Saunders Roe, Ltd., was formed. This firm has produced the very successful "Cutty Sark," "Windhover," and "Cloud" amphibians. The work of the firm will go on, but everyone will regret the passing of the man who first made that firm really great.



## A NEW ITALIAN LIGHT AMPHIBIAN

**A**LTHOUGH specialising in the construction of large machines, chiefly flying-boats, the Savoia Marchetti Company has had considerable success, both in Italy and America, with the small S.56 biplane amphibian. The company has now designed and built a small monoplane amphibian which incorporates several interesting features, especially in the undercarriage.

The S.80, as the new machine is called, is a 2-3-seater monoplane with a cantilever wing of "semi-thick" section. The wing is of wooden construction, covered with fabric, and is divided into a number of watertight compartments in order that it may keep the aircraft afloat in an emergency when the hull has been damaged. The differential ailerons are of welded-steel tubes. Wood construction is used for the adjustable tailplane and fin, but the elevator and rudder are made of welded-steel tubes.

The hull has a double-planked wooden bottom, using copper riveting. The main cockpit, which extends a small distance into the leading edge, is fitted with dual controls and sliding and adjustable seats. A third cockpit and luggage compartment is located in the trailing edge of the wing.

The engine mounting is made from chrome molybdenum steel tubes covered with fairings of "duraluminio" sheet protected against corrosion.

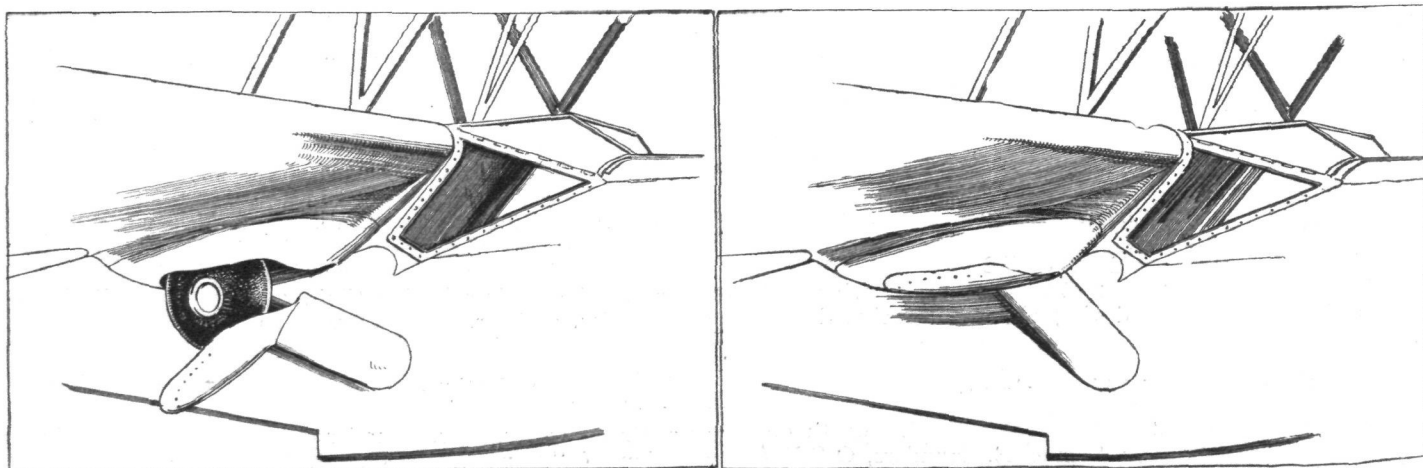
An undercarriage with retractable wheels is fitted. This is of patented Savoia Marchetti design, and when the wheels are "up," offers very little resistance indeed. Each half consists essentially of a pivoted shock absorber leg

which carries the wheel. The pivoting movement carries the wheel into a housing under the wing which is covered by a fairing above the wheel.

A single "Colombo" S.63 six-cylinder in-line air-cooled engine giving a maximum of 150 h.p. is fitted. Performance figures of the S.80 with this power plant are given below.

Wing span, 36 ft. (11 m.); length, 25 ft. 7 in. (7.80 m.); height, 8 ft. 6 in. (2.60 m.); wing area, 193.7 sq. ft. (18 m<sup>2</sup>); weight empty, 1,543.5 lb. (700 kg.); useful load, normal, 661.5 lb. (300 kg.); useful load, maximum, 882 lb. (400 kg.); total weight, normal, 2,205 lb. (1,000 kg.); total weight, maximum, 2,425.5 lb. (1,100 kg.); wing loading, normal, 11.4 lb./sq. ft. (55.6 kg./m<sup>2</sup>); wing loading, maximum, 12.5 lb./sq. ft. (61 kg./m<sup>2</sup>); weight per h.p., normal, 17 lb. (7.7 kg.); weight per h.p., maximum, 18.6 lb. (8.46 kg.); maximum speed, 141 m.p.h. (227 km.p.h.); minimum speed, 54.7 m.p.h. (88 km.p.h.); climb to 3,281 ft. (1,000 m.), 4 min. 22 sec.; to 6,562 ft. (2,000 m.), 11 min. 36 sec.; to 9,843 ft. (3,000 m.), 20 min. 19 sec.; to 16,405 ft. (5,000 m.), 56 min. 48 sec.; service ceiling, 18,045.5 ft. (5,500 m.); take off from land, 16 sec.; take off from water, 24 sec.; range, with two people and 44 lb. (20 kg.) of luggage, at 124 m.p.h. (200 km.p.h.); with 661.5 lb. (300 kg.) useful load, 621.4 miles (1,000 km.) (5 hr.); with 882 lb. (400 kg.) useful load, 497 miles (800 km.) (4 hr.).

C. DE R.



THE SAVOIA-MARCHETTI S.80 : The upper illustration shows this amphibian with its wheels down for land work, while our sketches show how the undercarriage retracts.

### Royal Air Force—Principal Air A.D.C. to the King

THE Air Ministry announces the appointment of Air Marshal Sir Robert Brooke-Popham, K.C.B., C.M.G.,

D.S.O., A.F.C., Air Officer Commanding-in-Chief, Air Defence of Great Britain, as Principal Air Aide-de-Camp to the King, in succession to Air Chief Marshal Sir Edward Leonard Ellington, K.C.B., C.M.G., C.B.E., Chief of the Air Staff.

# Some British Triumphs with NAPIER Aero Engines

**1918** A Napier-engined D.H. aeroplane climbed to a height of 30,500 ft. in 66 min., the greatest height at this date reached by an aeroplane.

**1919** A Napier engined D.H. aeroplane won the Aerial Derby. Speed, 129.3 m.p.h.

**1921** A Napier engined Gloster aeroplane won the Aerial Derby. Speed, 163.4 m.p.h.

**1922** A Napier-engined Supermarine flying boat regained the Schneider Trophy for Great Britain at a speed of 149 m.p.h.

**1923** A Napier-engined Gloster aeroplane won the Aerial Derby. Speed, 192.4 m.p.h.

**1926** The first non-stop crossing of South Atlantic Ocean carried out by Commandante Franco flying a Dornier flying boat with two Napier engines.

**1927** Schneider Trophy regained for Great Britain by a Supermarine-Napier seaplane flown by Ft.-Lieut. S. N. Webster, A.F.C. Speed, 281.669 m.p.h. Two machines completed the course—both fitted with Napier engines.

**1928** The greatest formation flight ever carried out was made with four Supermarine-Napier Southampton flying boats, each fitted with two Napier engines. The machines flew from England to Australia, round Australia, and back to Singapore, covering 180,800 engine miles without mechanical trouble.

**1929** The first non-stop flight from England to India was carried out with a Fairey monoplane fitted with Napier engine. 4,130 miles in 50 hr. 38 min.

**1930** For the fifth successive year Napier engines were selected by the Royal Air Force for their annual Service flight from Cairo to Cape Town and back. As on previous flights, no mechanical trouble was experienced.

**1931** The first and only non-stop flight from England to Egypt was carried out with a Fairey monoplane fitted with Napier engine. 2,857 miles in 30 hr.

**1932** Captain Sir Malcolm Campbell set up a World's Land Speed Record of 253.968 m.p.h. with his Napier-engined "Bluebird" car.

**1932** Fourteen officers and 534 men were transported from Ismailia to Iraq and back—a distance of 1,728 miles over nearly waterless desert. The aircraft used were Vickers "Victoria" troop carriers, each fitted with two Napier Lion engines.

## 1933

Squadron-Leader O. R. Gayford, D.F.C., A.F.C., and Flight-Lieut. G. E. Nicholetts, A.F.C., by flying a Fairey (Napier) monoplane from Cranwell, England, to Walvis Bay, South-West Africa, set up a World's long distance non-stop flight record—a distance of 5,309 miles covered in 57 hr. 25 min.

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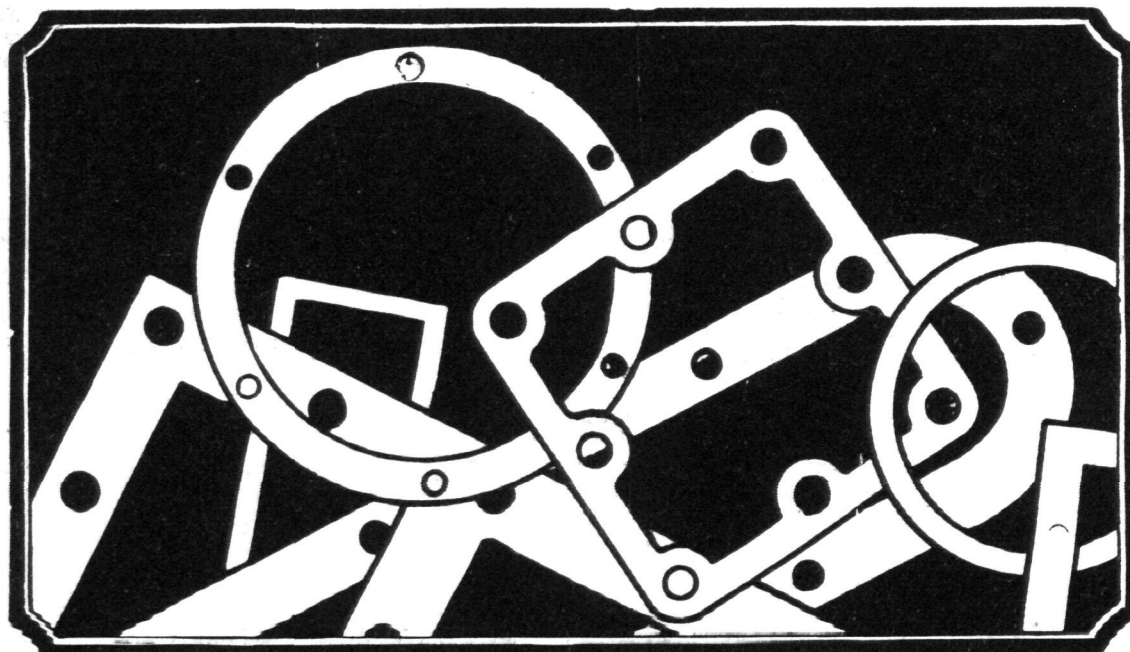
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## THE SOVIET STRATOSTAT

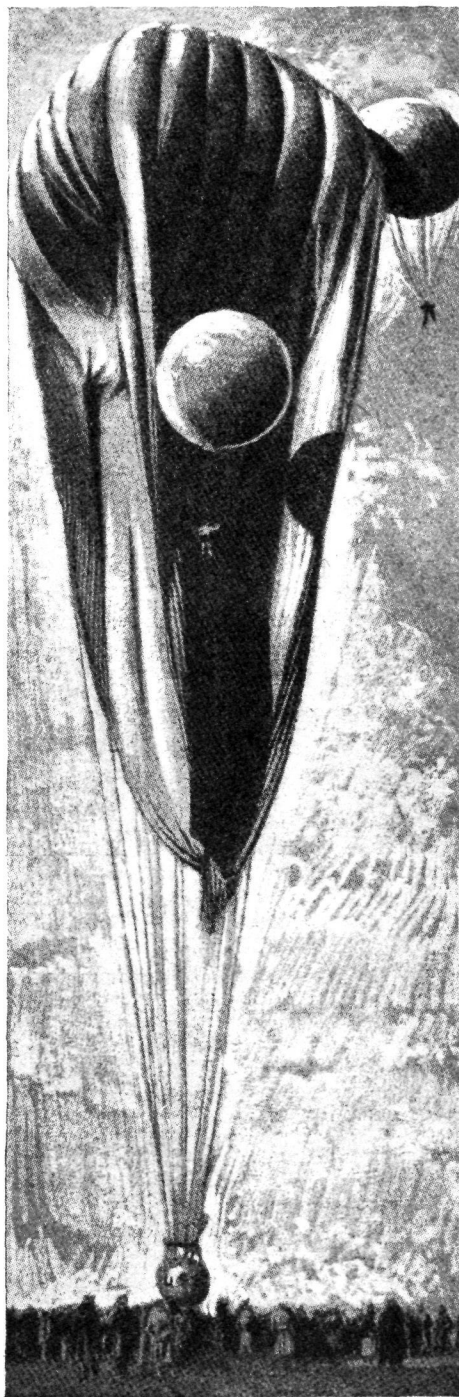
WE have already referred to the Soviet stratosphere ascent of nearly 12 miles, and to the scientific results obtained therefrom. We now give some further interesting details, published in the Soviet aeronautical journal *Samolet*, of the balloon *Stratostat U.S.S.R.* and the ascent itself.

It was decided to attempt the ascent into the stratosphere during 1933, and the whole question was investigated very thoroughly. The envelope for the balloon presented many problems, and these, both theoretical and constructional, were worked out by the Scientific and Investigation Institute for the Rubber Industry (N.I.I.R.P.). Thanks to the enthusiasm of the technical staff and personnel of this institute, the whole envelope was completed in a very short time. The envelope was 36 m. (118 ft.) in diameter, 24,340 m<sup>3</sup>. (859,688.8 cu. ft.) capacity, and weighed only 950 kg. (2,094.75 lb.)—Piccard's was 14,000 m<sup>3</sup>. (494,480 cu. ft.) and weighed 800 kg. (1,764 lb.). The fabric, the inside of which was rubber faced, was subjected to systematic scientific tests for the resistance at high altitudes to cosmic ultra violet Beta and Gamma rays, etc. Ing. Lewitin and Kuzina of the N.I.I.R.P. came to the conclusion that the colour best resisting ultra violet rays and other cosmic rays was aluminium.

The gondola represented work of about four months under the supervision of Ing. Chisheski. It consisted of twelve sheets of an aluminium alloy 2 mm. thick (Piccard's was cast aluminium) riveted with rivets of the same alloy. The gondola was 2.3 m<sup>3</sup>. capacity built up over a skeleton of tubes of the same alloy, strengthened with steel brackets.

The gondola was 7 per cent. lighter than anticipated with a factor of safety of 12; 5,000 rivets made the gondola airtight. It had two openings for entry and exit and nine inspection holes for navigation, etc. These were 100 mm. diameter with 8-mm. special chemically prepared glass. The gondola gave perfect safety to its occupants and freedom for scientific investigation, the bottom having a specially constructed shock-absorbing floor. All the instruments were of Soviet make, and consisted of altimeters, mercury barometer, meteographs, electrothermometers, apparatus for measuring cosmic phenomena and for examination of samples of atmosphere. The altimeter was placed inside in a hermetically-sealed box and connected by a tube with outside air. The meteograph automatically registered in graphic form the variance in temperature and moisture of air. The electrothermometers were used for detecting the intensity of cosmic rays.

At the beginning of September all was ready for the ascent, awaiting only clear weather. The commander was G. Prokovief, second in command E. Birnbaum, and the pilot, engineer and designer, K. Godounoff, all of whom were subjected to long training in high-altitude flight, including training under an artificial low-temperature pressure. In the night of September 23-24 all was ready for the ascent. At 10.40 p.m. the operation of filling the envelope was begun from 700 balloons, with the help of three 50-m. pipe lines. A fog, however, set in, and when it cleared it was found that the moisture collected on the



*This illustration, reproduced from "Samolet," shows the Soviet balloon "Stratostat U.S.S.R." just before the start. Note the small inspector-balloons*

envelope added 500 kg. to the weight. The attempt, therefore, had to be abandoned, and work had to be started drying the envelope.

On September 30 another attempt was made. By 6 a.m. the filling with hydrogen was finished, and when this was done two balloons with men suspended were raised who looked over the entire envelope and vent. With the first ray of sunlight the gondola was attached, and round it was secured ballast of 620 kg. of soft earth; 300 kg. of ballast was also placed inside the cabin. A special commission of five professors sealed the scientific instruments.

The stratostat was filled with gas to the extent of 1/10th of its capacity, i.e., 3,000 m<sup>3</sup>. It was anticipated that at the height of 17 km. the gas would expand and fill all the space and change the shape of the balloon into a perfect sphere. By 8.30 a.m. all three men were on board. In ten minutes the order was given to start, and for the last time the vent was tested. Five minutes after the start the balloon had ascended to 3 km.; at 9 a.m. to 6 km.; five minutes later it reached 10 km. from the ground, and the outside temperature was -55 deg. C.; at 9.08 a.m. 12 km. was reached (temperature -60 deg. C.); at 9.14 a.m., 15 km., and the temperature rose slightly to -55 deg. C.; at 9.25 a.m. the balloon reached the record of Piccard, at 17.2 km. above sea level, the temperature being -54 deg. C. Inside the cabin the temperature was normal. At 9.32 a.m. the rate of ascent was observed to be only 1 m. per sec., the height was then 17.5 km. and the temperature -46 deg. C. At 9.58 a.m. the height was 17.9 km. The gondola temperature inside was +14 deg. C.; at 11.2 a.m. the height was 12 km. and the temperature -67 deg. C. The inside temperature was +22 deg. C.

At this altitude, 80 kg. of ballast was thrown out. The envelope inflation was 75 per cent. All this time the cabin was in radio communication with various stations. At 11 a.m., judging from the ground view, the aerostat was 24 km. south-east of the starting point. At 12.3 p.m. a new load of ballast was thrown out, the altitude now being 18.4 km. The atmospheric pressure on mercury column was 51 mm. (ground level pressure normally is 760 mm.). The envelope answered entirely to the theoretical expectations, and, having fully expanded, it represented a perfect spherical form. At 12.45 p.m. the record height was reached of 19 km. From this point an official message by radio was sent out. The balloon's radio was equipped with eight anode batteries and it weighed 60 kg. The wave length used was 69 m. from the balloon and 75 m. from the earth. At 1 p.m. descent began. At 1.16 p.m. the aerostat was 50 km. south-east of the starting point; at 2.40 p.m. 17 km., at 3.25 p.m. 14 km., 3.40 p.m. 13.5 km. and at 4.23 p.m. the height was 10 km. The balloon seemed to be now leaving the stratosphere.

At 5 p.m. the balloon successfully landed on the bank of the River Moskva, near Kolomna. The landing was made in perfect order. A commission arrived and met the aeronauts. The scientific instruments were found in perfect order and were handed over for examination. The



descent from the 19th km. to earth occupied three hours and the ascent was from 6-8 m. per sec. The height of 18 km. was accomplished in 43 min. All the instruments worked faultlessly. From the height of 17-18 km. the visibility was of 70-80 km. radius and the colour of the sky was blue in the lower strata of the atmosphere, but deep violet in the stratosphere itself. It was found impossible to look with unshaded eyes into the sun, and it was therefore found necessary to wear special light filters.

Up to 17 km. no ballast was thrown out from the gondola. The inside temperature varied from +12 deg. C. to +32 deg. C. and the mean pressure of mercury column at the highest was 49-50 mm. Although the envelope was four months old at the time of the flight, the hydrogen did not escape, and instead of deteriorating the envelope actually improved. It is believed that even a higher altitude could have been reached if more ballast had been thrown out. The flight occupied 8 hr. 15 min.



## SPEED-BOATS AS TARGETS FOR BOMBERS

Mr. Scott Paine's Invention

THE Air Ministry, having decided that they required a high-speed mobile target for bombing practice, approached Mr. H. Scott Paine through their Marine Department with a view to providing a moving target of a speed of from 20-30 m.p.h. Mr. Scott Paine, in collaboration with the Air Ministry, projected an armoured target-boat which involved the overcoming of a number of technical problems thought at one time to be insoluble. The boat had to be constructed to keep at sea in all kinds of weather conditions at high speed and at the same time to be capable of carrying an enormous load of armour and petrol. The machinery, petrol and personnel had to be fully protected against direct hits from bombers. The boat had to be rendered unsinkable. The space available demanded the installation of engine power thought up to that time to be incapable of efficient working. Wireless had to be fitted, together with smoke-screen devices and sufficient petrol to enable the boat to get to the bombing area and remain there for considerable periods of time.

One of the outstanding features of the boat is Mr. Scott Paine's idea of housing the armour on rubber-fitted footings, which increase the efficiency of the armour considerably. A new material of hard expanded rubber which is considerably lighter than cork provide the necessary buoyancy in case of a direct hit, and the arrangement of triple-screw machinery was carried out in such a manner as to disprove practically all the known theories on the subject.

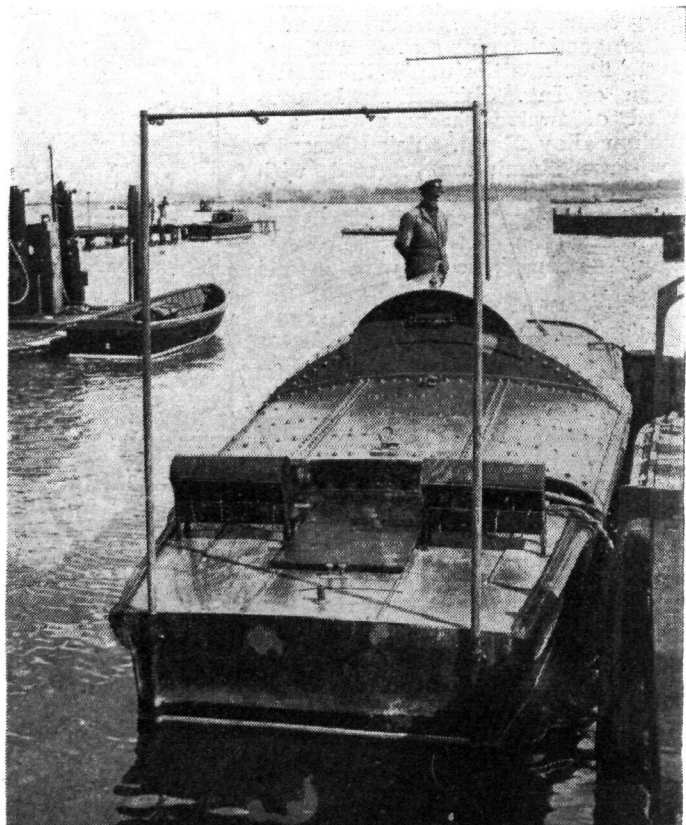
The bombs dropped on the speed-boats are 8-lb. or 11-lb. practice bombs. It is stated that the crew, which consists of three men from the Marine Aircraft Experimental Establishment at Felixstowe, suffer no ill-effects from concussion if a bomb falls directly on the armour plating.

The British Power Boat Co., which is entirely owned by Mr. Scott Paine, has once again proved itself to be of considerable national value in producing these boats, especially when it is remembered that the time at the disposal of the company was only eight weeks from the formulation of the idea to the delivery of the boats. It is a matter of congratulation to everyone concerned that the first of these boats was on trial and accepted six weeks from the date the order was received. These boats were in continuous service on the North Sea for two seasons of six months each and were working every day. It is an acknowledged fact that, apart from saving immense sums of money involved when Government ships have been used as targets, these boats have provided for the first time a satisfactory moving target.



Just prior to going out to bombing practice at Bridlington. Men in "outside" cockpit which they have to abandon during actual bombing. Below: View from stern showing smoke-screen devices. Note wireless aerial.

(Courtesy of the British Power Boat Co.)



## French Civil Aviation Directorate reorganised

THE "Journal Officiel" has published a decree dated December 7 relative to the reorganisation of the Directorate for Civil Aviation. In the new Directorate, which will be controlled by a Director and a Sub-Director, there

will be three Departments ("Bureaux") and two Sections. The Regional establishments for Air Navigation, with headquarters at Paris and Marseilles, together with two other departments, has been abolished, and the Civil Aviation Directorate will now take direct control.



# POSSIBLE FUTURE DEVELOPMENTS OF AIR-COOLED AERO ENGINES\*

By A. H. R. Fedden, M.B.E., F.R.Ae.S., M.I.A.E., M.I.M.E., M.S.A.E.

(Continued from page 1267)

## Increase in Rotational Speed

### (i) *Methods of Breathing the High-Speed Aero Engine of the Future.*

One of the most logical methods of obtaining more power from a given swept volume is by increasing the crankshaft speed, and I suggest that this step must be faced during the period under review, but it brings in its train a whole series of knotty problems, such as the breathing capacity of the cylinders, improved technique of valve mechanism, strength and rigidity of the crankshaft and connecting rods (the loads on many of the moving parts being increased as the square of the speed), and the necessity of providing reduction gearing to maintain an efficient propeller.

Increase in speed is limited primarily to the breathing capacity of the engine, and, as stated previously, it is considered bad practice to utilise the blower to force mixture through the valves—except for short periods of ground boosting for take-off purposes. A recent investigation has been made into the pros and cons of two and four valves for large capacity cylinders, and, while two valves offer certain advantages for simplified operation, lightness and cooling, there can be no doubt that four valves per cylinder give a much greater ratio of port area to piston area. Inlet gas speeds of 300 ft. per sec. are by no means unknown with two-valve designs, whereas there is no doubt that the optimum speed should be of the order of 180 ft. per sec.

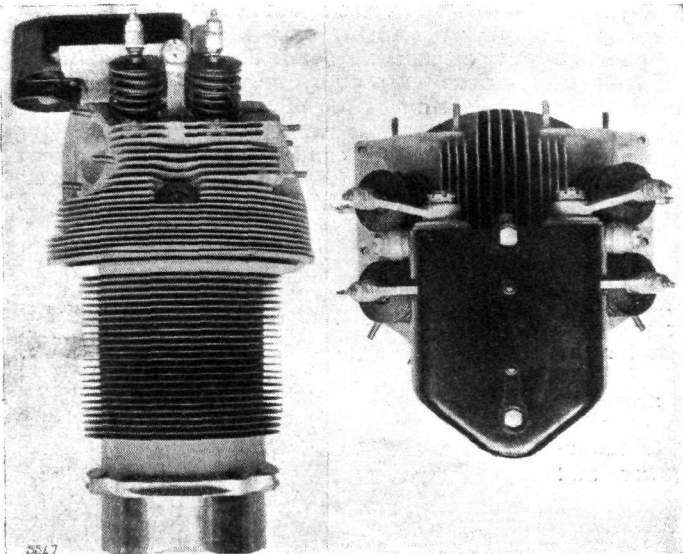


Fig. 13 : Bristol four-valve rocker assembly.

Fig. 13 shows the Bristol four-valve rocker mechanism and cylinder head, as used on the "Pegasus" and "Mercury" engines.

It is estimated that if two valves are to be retained, the swept volume of the cylinder should not exceed  $1\frac{1}{2}$  litres ( $91\frac{1}{2}$  cu. in.) capacity, to maintain the necessary efficiency at the high crankshaft revolutions under discussion.

### (ii) *Valve Mechanism.*

A serious problem in connection with the proposed increase in engine speeds is the necessity for obtaining reliable operation from the valve mechanism. Push rod valve mechanism for air-cooled engines, which has been almost universally adopted during the last few years, and which is cheap to manufacture and light in weight, is, I am afraid, going to be quite inadequate for the engine speeds which I have suggested will be standard practice in the future.

After extended development, reliable continuous running can be obtained from a four-valve, 3 litre (183 cu. in.)

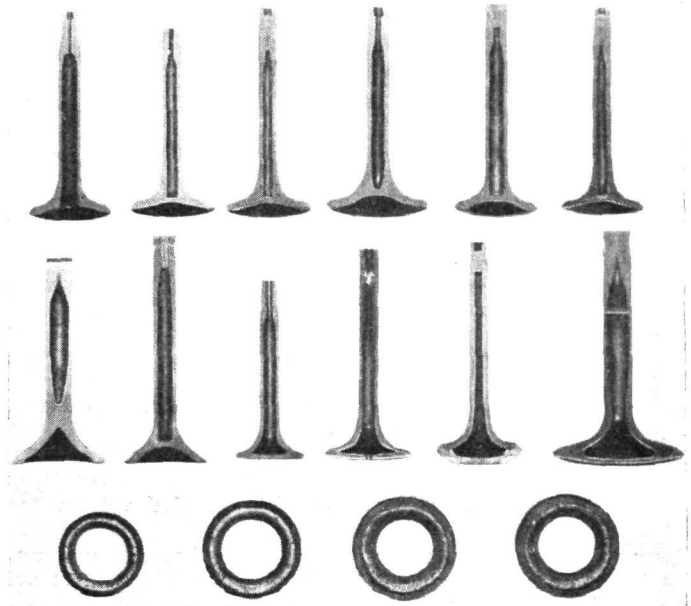


Fig. 14 : Specimens of salt-cooled valves and seats.

capacity cylinder, with mechanical compensation to the push rod mechanism, up to 3,000 revolutions per minute, but even with these speeds the mechanical problems become very severe.

Adequate life of the mechanism may be preserved a stage further by the successful adaptation of the hydraulic tappet, the possibilities of which are now being explored by a number of engine manufacturers, but, to cope with the speeds required, I suggest the push rod operated valve must be dispensed with altogether. It is probable that the adoption of the overhead camshaft, with as nearly direct operation as is feasible, will be necessitated by further increases in engine speeds up to 4,000 revolutions per minute. Careful detail design, to obviate the blanking of cylinders and to eliminate oil leaks, will be necessary. The only other alternative is to leave the poppet valve altogether, upon which more will be said later.

To take proper advantage of the higher octane specifications referred to, it will be necessary to stiffen the crankshaft and crankcase considerably, and to make a careful study of the technique of valves and valve seats originated by Mr. Heron, late of the R.A.E., Farnborough, and at present at the Matériel Division of the Air Corps at Wright Field, America.

To deal with the valve and valve seat problems, hollow valves with metallic sodium filling and special facings to the seats are necessary, and Fig. 14 shows examples of these valves and seats. Fig. 15 shows examples of the valves in diagrammatic form. These valves are a patented process of the Wilcox-Rich Corporation, Detroit, U.S.A., who have carried out a considerable amount of research over a wide range of types.

### (iii) *Crankshaft and Bearings.*

Increased engine speeds mean higher bearing loads. It is suggested that, by careful design, the strength and rigidity of the crankshaft can be maintained to meet the increase of rotational speed, but higher speeds and consequent greater pressures have already caused some difficulties with the white metals which have been standard practice on British aero engines up to the present time.

Development of harder bearing material, such as the family of steel-backed lead bronzes upon which considerable development has been achieved in America, will, I hope, be capable of coping with increased crankshaft rotational speed. The use of these harder bearing materials will, I suggest, necessitate the use of hardened crankshafts, although I understand that certain American firms have obtained satisfaction with unhardened shafts.

\* Abstract of paper read before the Royal Aeronautical Society on December 7, 1933.

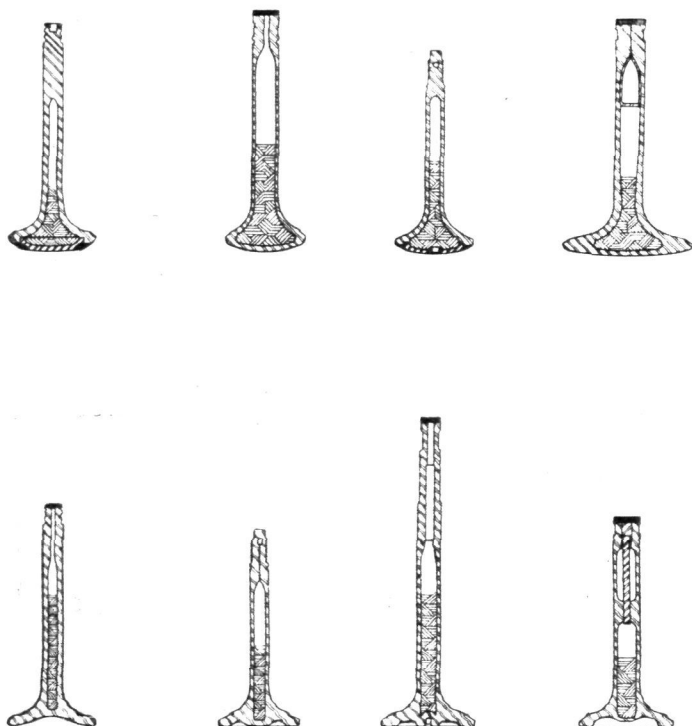


Fig. 15 : Representative types of salt-cooled valves.

For the crankshaft, the engine designer has the various alternatives of case-hardening alloy steel, nitrided steel of the nitralloy type, or nitriding chrome molybdenum steel. The Brinell hardness obtainable with the first and third types is about 650 to 750, while nitralloy offers a hardness of 800 to 1,100.

I believe that chrome molybdenum steel offers the best solution, owing to the freedom from difficulties experienced when case-hardening large diameter shafts.

For big end bearings, the most promising alternatives I suggest are steel-backed lead bronze, or the needle roller type. It would appear that the former is the most hopeful immediate solution, because the latter, although having many attractive points, presents difficult problems—especially in the larger sizes.

#### (iv) Reduction Gear.

Increased rotational speed necessitates the adoption of airscrew reduction gear, if propeller efficiencies are to be maintained; and the use of reduction gears on high-powered engines has been general practice in England for the last few years. The Bristol Company, on their range of radial air-cooled engines, have not produced any ungeared engines for the past three years.

From the type of future engine outlined in this paper, the necessary power will be obtained by a combination of high brake mean effective pressure and high revolutions per minute, which will necessitate reduction gears being universally adopted, even on moderate power and smaller size engines.

Mr. B. Waseige, Technical Director of Messrs. Farman, France, has recently laid down that an efficient two-bladed airscrew should pass 3.35 lb. of air per horse-power/second, whilst tip speeds ought not to exceed 820 ft. per sec. for low altitude machines and 980 ft. per sec. for high altitude aircraft.

Concentric reduction gears are desirable for air-cooled radial engines to obviate air flow interferences, and the Farman bevel reduction gear, as standardised on Wright and Bristol engines, offers several advantages. The Farman type is very robust, gives considerable damping effect to the crankshaft system, and enables a wide range of propeller speed reduction to be obtained. With the increase of crankshaft rotational speed, reduction ratios of more than 2 to 1 will be necessary. Fig. 16 shows a selection of Bristol reduction gears for radial air-cooled engines.

#### Lubrication

Since the introduction, by the British Air Ministry, of a straight mineral oil specification some three years ago, lubrication problems in England and America have been generally of a similar nature, except that I understand higher viscosity oils are used on air-cooled engines in America than are permitted in England.

There are two points I would like to touch upon, namely, oil consumption and sludging.

In an interesting paper on air-cooled aero engine design, read before the S.A.E. in America, by Mr. Philip Taylor, in April, 1931, an instructive curve was shown illustrating the consumption on air-cooled engines as being extremely critical, and suggesting that a rapid rise is reached after a certain engine speed. As already stated, I expect to see a considerable increase in revolutions per minute on future types of air-cooled engines, and this question of high oil consumption, from the point of view of the total weight of the power plant for a given range, is of the utmost importance to aircraft designers. Reduction in oil consumption on the air-cooled radial engine is susceptible to treatment along several lines, such as: From the cylinder aspect, stiffer cylinder flanges, barrels and skirts; from the piston aspect, by suitable detail design modifications; and from the crankcase aspect by means of more efficient breathing and scavenging of the oil.

Oil temperature is also an important factor affecting oil consumption and sludging, and I suggest that we may hope that the oil technologists will, within a reasonable time, provide lubricating oils which may be employed with

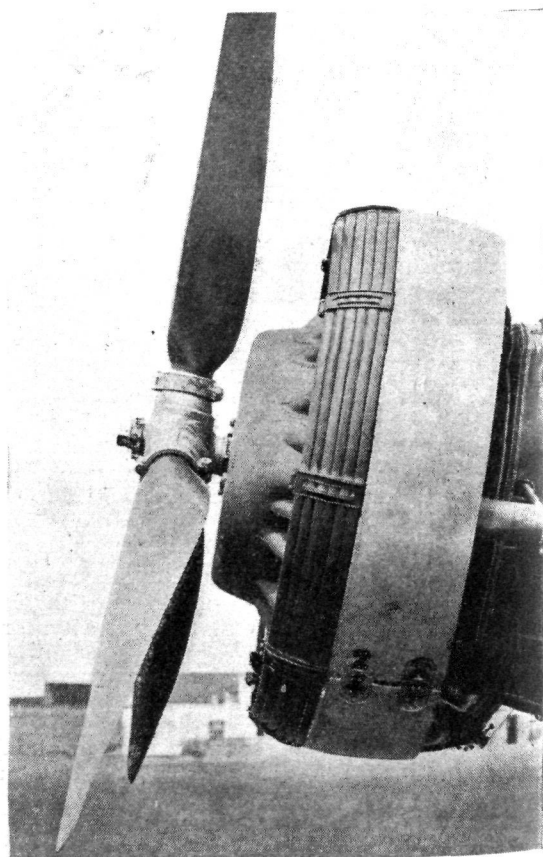
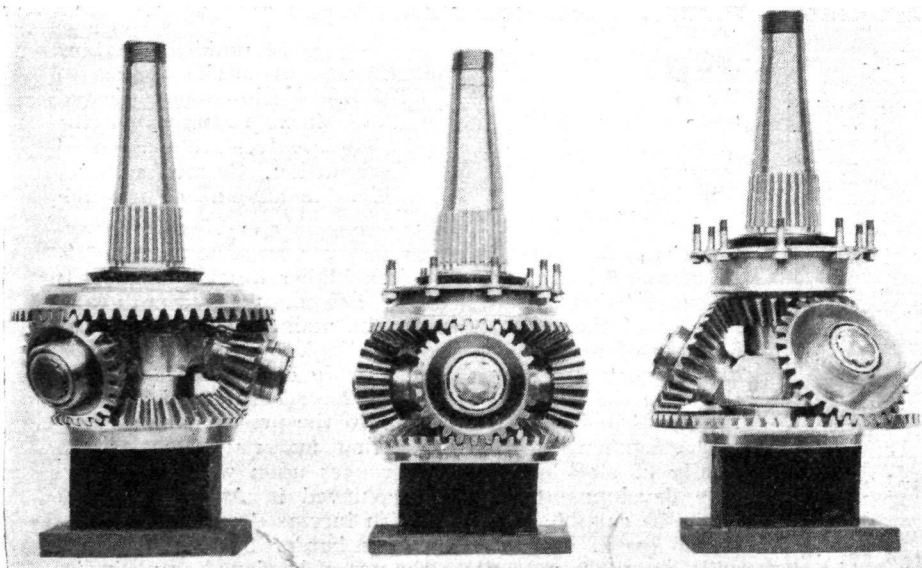


Fig. 16 : Bristol reduction-gear units of different ratios. On right, Fig. 17, a nose-type oil cooler.

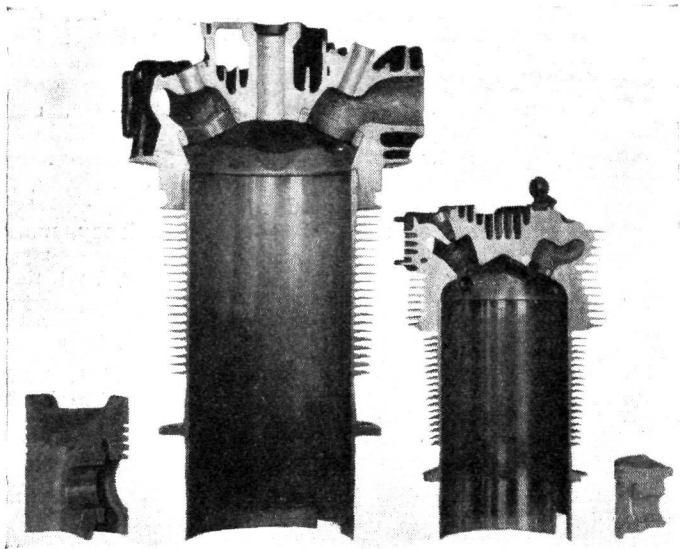


Fig. 18 : A Bristol compression-ignition cylinder compared with a "Jupiter" cylinder.

considerably higher temperatures and eliminate some of the sludging problems.

When one considers the extent to which the steam-cooled engine constructor is asking the aircraft designer to go in respect of bulk, weight, and expense, on leading edge coolers, it would appear that the air-cooled engine maker has every right to ask for a considerably larger capacity and more efficient low drag oil radiator than is at present standard practice.

Fig. 17 shows an attempt along these lines, which has given excellent results from the oil-cooling standpoint. Better oil straining and centrifuging is a logical request to make for high-speed air-cooled engines employing straight mineral oil.

#### Compression-Ignition Engines

When reviewing the problems of fuel consumption of aircraft engines, certain aspects of the compression-ignition engine must inevitably present themselves.

The Bristol Company have been working on compression-ignition development for a number of years, on behalf and with the assistance of the British Air Ministry, but it is not possible here to go into details of the work that has been accomplished. It is sufficient to say, however, that some promising results have been obtained in England, particularly in regard to the fuel consumption of aircraft engines operating on this cycle; 0.360 lb./brake horse-power/hr. can be obtained consistently at cruising powers with steady running and clean exhaust, and 0.39 lb./brake horse-power/hr. at normal power, but this is not possible with as high a maximum brake mean effective pressure, or anything like as high a power/weight coefficient as with a petrol engine.

Some eight years ago the Bristol Company commenced development on a large four-cycle compression-ignition air-cooled single cylinder of  $8\frac{1}{2}$  litre (503 cu. in.) capacity (see Fig. 18). A number of different cylinders and pistons were developed, and promising results were ultimately obtained from this unit. Altogether over 2,000 hours' research work were carried out on this size of cylinder, with brake mean effective pressures in the neighbourhood of 90 to 100 and a consumption of less than 0.4 lb./brake horse-power/hr. Some three years ago it was decided that there was no immediate future for a large compression-ignition engine with cylinders of

this capacity, and, in consequence, experimental work was commenced on a cylinder of the "Pegasus" size, i.e., just over 3 litre (183 cu. in.) capacity, embodying in it the results of previous experience.

The Bristol "Phoenix" engine, which has been developed by the Bristol Company as a result of this later experimental work, is of the nine-cylinder radial air-cooled type, and of the same swept volume as the "Pegasus." This engine has completed 200 hours of bench testing and flying to date, and many thousands of hours of single-cylinder research work. Fig. 19 shows two views of this engine.

The flight reports obtained have been far beyond our expectations, and the bogey of Diesel "thump" has been entirely dismissed, the reports stating that the engine was comparable with a normal petrol engine as regards quality of running.

It is suggested that the power/weight ratio that has been obtained on the "Phoenix" engine is probably as good as can be expected for a four-cycle compression-ignition engine. I think it may safely be said that a successful air-cooled four-cycle compression-ignition engine will weigh 30 to 40 per cent. more than its petrol-engine counterpart, but will have a cruising consumption 30 per cent. less than a corresponding petrol engine.

Throughout their experience, the Bristol Company have adhered to a maximum pressure of 850 lb./sq. in., and have employed standard Navy fuel oil of 0.870 specific gravity, and of a specification readily obtainable all over the world.

Prior to the flight tests on the Bristol "Phoenix" engine, it was thought that this increased weight would be a serious obstacle to the extensive use of compression-ignition engines, until such time as aircraft were regularly operated on longer non-stop stages than at present, but that such engines would give considerable advantage in weight-carrying capacity on long flights in excess of six to eight hours. The flight tests referred to, however, have shown that the power-maintenance factor at altitude, with the compression-ignition engine, falls off much more slowly than that for the petrol engine, to such a degree, in fact, that it is suggested that the four-cycle compression-ignition engine will show an advantage in all-up weight on a flight of four hours' duration, when the cruising range is considered at a height of approximately 10,000 ft.

Fig. 20, shown by the courtesy of the Westland Company, illustrates this point.

One of the greatest obstacles to the use of the compression-ignition engine has been the inability to obtain a high brake mean effective pressure for take-off without increasing the fuel charge to a point resulting in a foul exhaust. Single-cylinder research work has proved that supercharging will assist this problem and will provide a four-cycle compression-ignition engine such as the "Phoenix" with sufficient power for take-off to make the engine a commercial possibility.

It is, of course, obvious that the advantages of the compression-ignition engine, from the aspect of fuel consumption, are further reduced by every step-up in octane value of standard fuels, while its claims from the aspect of fire risk are also somewhat nullified by the use of a high flash point hydrogenated fuel which may be used with the direct fuel-injection engine.

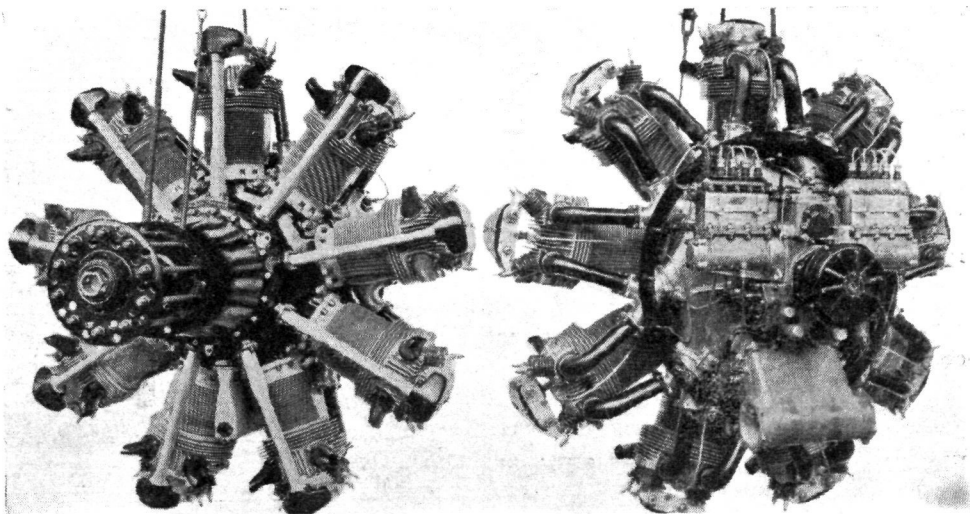


Fig. 19 : Three-quarter front and three-quarter rear view of the Bristol "Phoenix" compression-ignition engine.



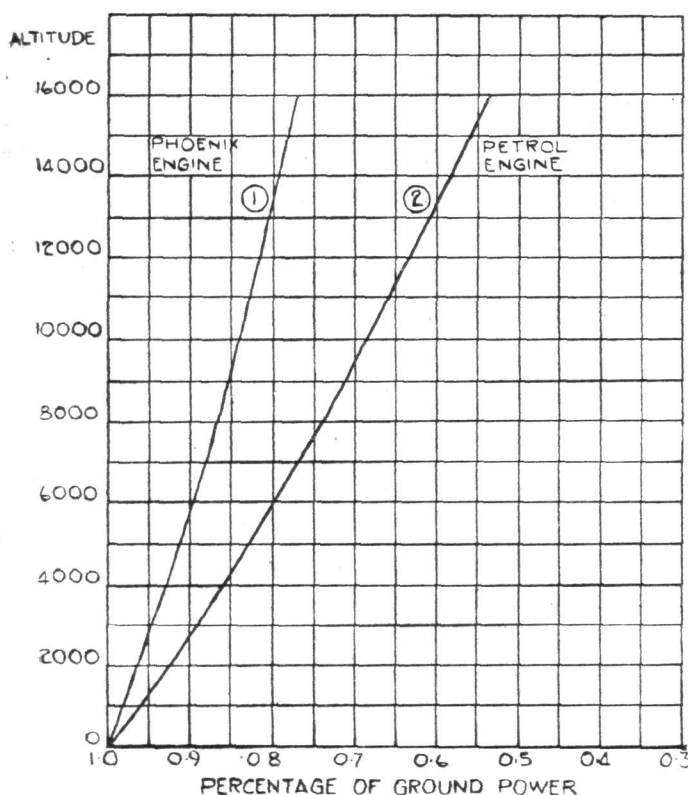


Fig. 20 : Relative power maintenance at altitude. The "Phoenix" engine curve is based on Westland Company's flight-test data. The petrol-engine curve is based on standard Air Ministry correction factor.

#### Direct Petrol Injection

I well remember the first direct petrol-injection engine that I ever saw—early in 1911—on the "Antoinette" monoplane, belonging to the well-known pilot, Latham. It was an eight-cylinder "Levavasseur" engine with several interesting features, including condenser cooling. I am of the opinion that direct petrol injection lost ground, and finally disappeared in those early days because of lack of technique in manufacture, and because the line of least resistance was to make use of the carburetter, upon which so much more development had been carried out on the motor car. Of recent years, interest has been revived in direct petrol injection for aviation engines, and a considerable amount of development work has been accomplished on these lines in America.

Experimental work has been carried out by the Bristol Company and the Westland Company on the test bench and in the air, on direct petrol injection, on behalf of the British Air Ministry, but at the present time I am not at liberty to give details of the design of the fuel-injector system employed.

Two important factors in favour of direct fuel injection are—elimination of freezing, and the ability of this system to use hydrogenated fuels, with high knock ratings, which cannot be carburetted owing to their low volatility. One cannot help feeling that had the problem been reversed, and we had been brought up to consider direct petrol injection as the standard equipment, we should hail the carburetter as a simpler solution. This view is not held in America, and direct petrol injection is being developed on a high priority, and a live interest is being taken in its adaptation on a number of different types of aircraft.

#### Two-Stroke Engines

I do not expect to see very serious competition from the two-cycle prin-

ciple during the next ten to fifteen years, except in conjunction with a compression-ignition or Diesel type of engine. Personally, I do not view the possibilities of the normal two-stroke petrol engine favourably, owing to cooling problems, low efficiency, fuel wastage, etc., although I suggest that a supercharged direct petrol injection version of the two-stroke engine, in the smaller sizes, might conceivably possess advantages worth exploiting, as the scavenging could be achieved with air only, and fuel wastage reduced. In an attempt to attain efficiency, many projected two-stroke engines have gradually become more complicated than their four-stroke competitors, and thus one of the chief attractions of the two-stroke engine has been lost.

#### Sleeve-Valve Mechanism

I am one of those who believe that the poppet valve is still with us, because of the immense amount of development work that has been devoted to it. Even so, with the trend of design of aircraft engines, the poppet valve and its seat are steadily becoming more expensive and complicated, as already outlined in this paper, and I believe that if only the same development had been given to some other system such as, for example, the sleeve valve, our engines to-day would be of superior performance and cheaper manufacture.

The sleeve valve, and particularly the single sleeve of Burt McCollum type, offers a number of advantages not possessed by the poppet valve.

During the last six years the Bristol Company have carried out an extensive research on the single-sleeve valve for air-cooled aero engines, on behalf, and with the collaboration, of the British Air Ministry. Some seventeen hundred hours have been completed on a single-cylinder unit, and Fig. 21 shows one of the cylinders used on this single-cylinder development.

Recently a complete nine-cylinder sleeve valve radial air-cooled engine, called the "Perseus," was submitted to an entirely satisfactory hundred hours' official type test, and Fig. 22 shows a view of this engine. Subsequently a fifty hours' high-power test followed by a fifty hours' weak-mixture test, were successfully completed with the same engine, and it is a present undergoing flight test in an aircraft.

Fig. 23 shows a view of the "Bulldog" with "Perseus" engine.

At the present time it is not permissible to go into the technical details of this engine, but it is interesting to note that the test was carried out without any maintenance or adjustment, and without removing the sparking plugs, during the whole of the test, and with a lower fuel and oil consumption than we have ever achieved on a poppet-valve engine of similar layout.

As a result of this development work on the single-sleeve valve for air-cooled aero engines, it is considered that:—

- (1) Greater all-round thermal efficiency can be obtained than with the overhead poppet valve.
- (2) That for a given cylinder capacity, approximately one compression ratio higher can be used, with the sleeve valve, than with the overhead poppet valve, with any given octane number fuel.

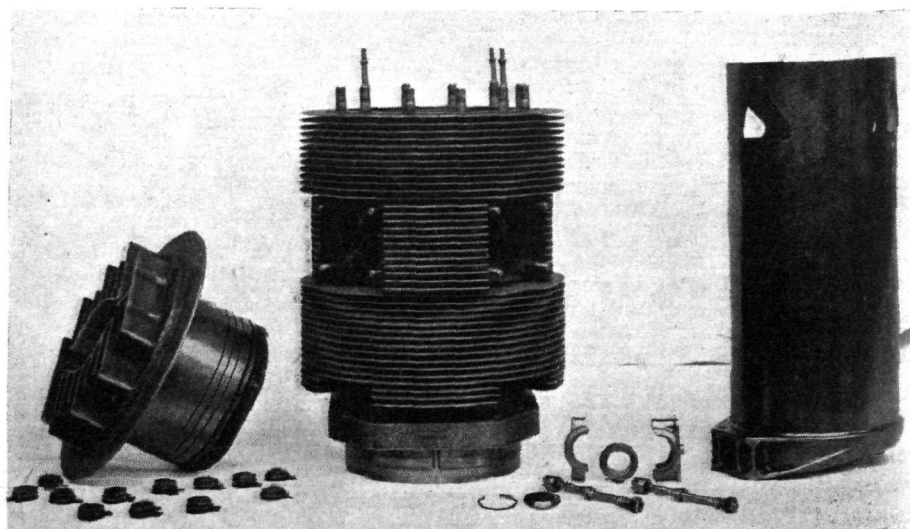
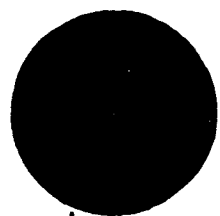


Fig. 21 : Cylinder and sleeve of Bristol "Perseus" unit.



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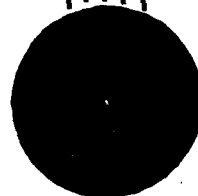
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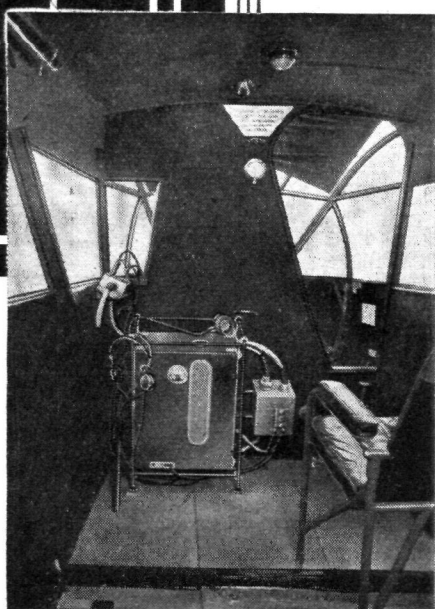
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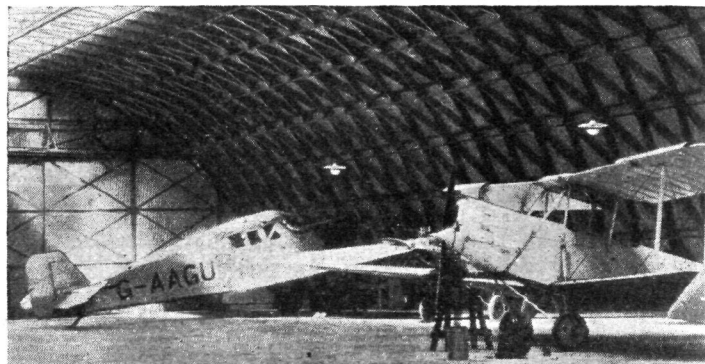
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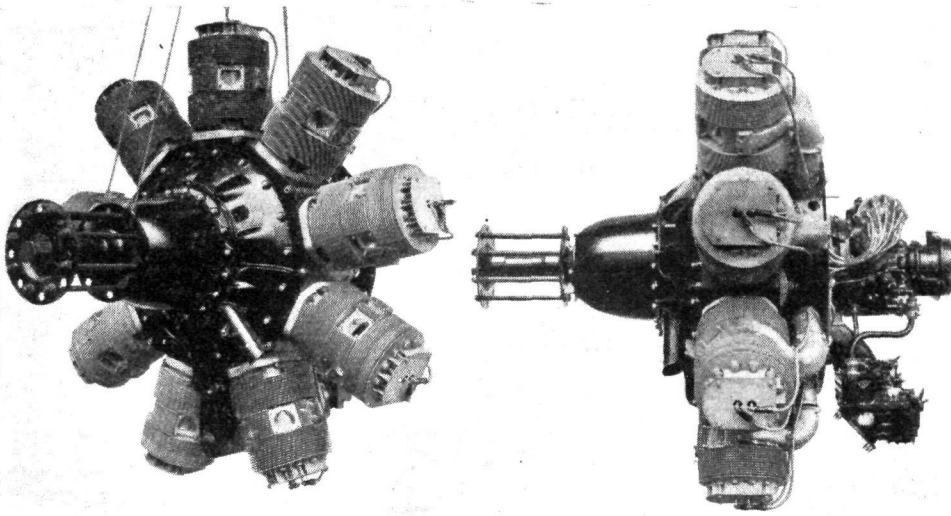
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Fig. 22 : Two views of the Bristol "Perseus" sleeve-valve engine.



craft, they have been far too long coming into fruition, and that one of the most important directions in which they can be speeded up is by the aircraft designer instructing the engine maker as to his requirements aerodynamically, and then letting the engine maker endeavour to develop the device from a mechanical standpoint.

The above remarks apply more aptly to Europe than to America, where a combination of aircraft and engine has been developed, which enables the efficient use of the controllable pitch propeller to be made, and where this device

has actually been brought to fruition on the lines which I suggest are the only practical solution of the problem.

The problem can be divided into two classes—(a) multi-speed gear, and (b) variable pitch propeller.

(a) While, at one time, I had hoped that the multi-speed gear would be worth while on such types of heavily loaded aircraft as flying boats, etc., where take-off is extremely critical, even though it might not be the ultimate solution, an investigation into the possible improvements in performance, with a multi-speed gear and supercharged engine, showed a disappointing increase in thrust horsepower for take-off, and different gear ratios would be required for varying installations.

(b) Propellers whose pitch may be altered while in flight may be divided into four main types, and, omitting the blades, it would appear, in the present state of development, that the weight of the hub, complete with its controllable mechanism, for an engine of 600 to 700 h.p. is of the order of 100 lb.

The four main types are as follows:—

(1) *Automatic Type.*

In this type no pilot's control is provided, and the pitch of the blades may depend on either the speed or power transmitted, or on a combination of both.

(2) *Manual Controllable Type.*

This type is one in which movement of the pilot's control causes continuous alteration of the pitch.

(3) *Governed Pitch Type.*

This consists of a controllable pitch airscrew fitted with a suitable follow up mechanism. It enables the pilot's control to be graduated, and it is possible for his lever to be set immediately at a desired pitch, whereupon the follow up mechanism causes the blades to assume this pitch gradually and maintain it.

(4) *Governed Speed Type.*

Here the pilot's control permits adjustment to any engine speed within the operating range, this speed being subsequently maintained by some governing device. This,

- (3) Correspondingly, in case of emergency, a lower grade of fuel can be used, with any given compression ratio, than with the poppet-valve engine.
- (4) Lower fuel and oil consumptions have been obtained than with the corresponding poppet-valve type.
- (5) Lower cost of manufacture than with the corresponding poppet-valve type.
- (6) Greater scope for large production with unskilled labour.
- (7) Materials are more easily obtained.
- (8) Lower maintenance costs.
- (9) It is more able to stand ground boosting, and more easily adaptable to higher rates of supercharge, than with the corresponding poppet-valve engine.
- (10) Cooling and cowling problems are simpler.
- (11) Deleterious effects from leaded fuels would appear to be less apparent than with the poppet-valve engine.
- (12) Lower exhaust ring temperatures, combined with sleeve-valve operation, minimise fire risk.

It is suggested that there is an important future for this type of valve operation for the air-cooled aero engine, and the complete absence of normal maintenance work makes it attractive for civil work.

#### Obtaining the Maximum Thrust Efficiency from Available Brake Horse-Power

It has been claimed for some time past that an improved take-off and cruising range could be obtained from existing aircraft power plant if some means of altering the propeller shaft gear ratio or changing the pitch of the propeller itself, could be effected at will by the pilot, while in flight.

I realise that this problem does not strictly come within the purview of this paper, because it is aerodynamic rather than thermodynamic, but I propose touching on the mechanical side, as I hold the view that, if adequate reasons exist for either or both of these changes being introduced into the power transmission section of an air-

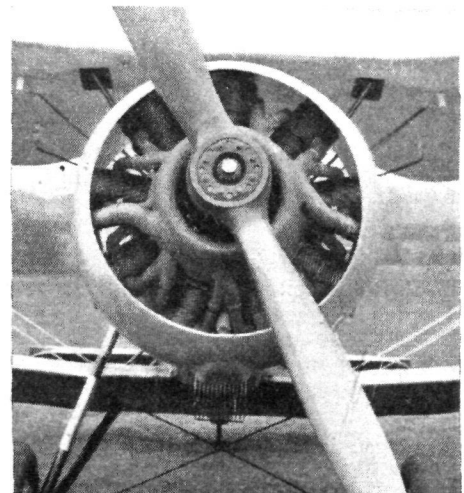
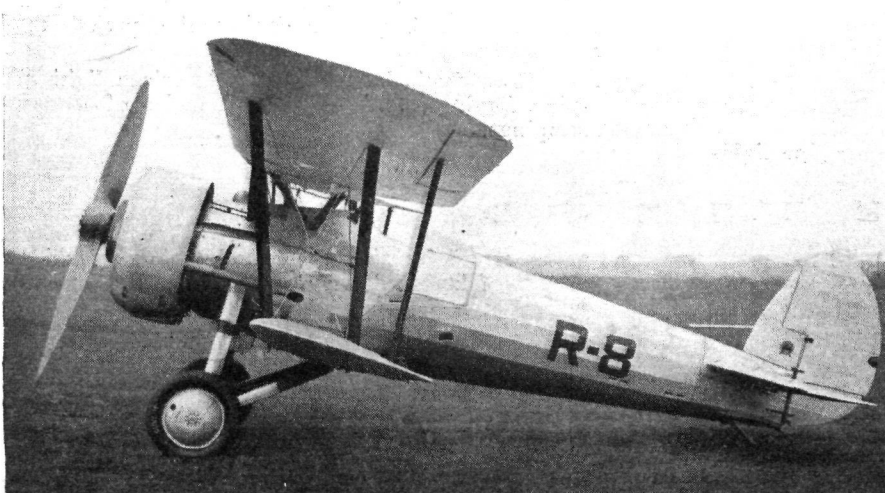


Fig. 23 : Bristol "Perseus" engine installed in a Bristol "Bulldog."

**Fig. 26 : Examples of American aero-engine steel stampings.**

I suggest, is the best type of variable pitch mechanism, inasmuch as it relieves the pilot of all responsibility, even in aerobatics, and minimises any tendency to run the engine beyond maximum crankshaft speed.

#### Development of Aircraft Engine Material

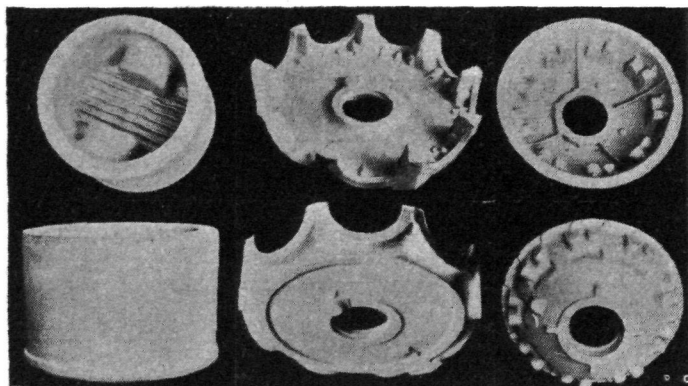
Owing to economic conditions and the comparatively small output, the British aero engine constructor is, at the present time, at a serious disadvantage, as compared with certain other countries, in regard to the technique and quality of raw materials for the manufacture of his engine, and this is a serious handicap which it is hoped may be remedied as soon as is feasible.

Dealing firstly with ferrous alloys, perhaps more important than anything else is the cleanliness of aero engine steel. I think steelmakers in England during the last few years have realised the importance of this fact to aero engine manufacturers, and some work is being done along the lines of improving the manufacture of steel for aircraft engine purposes, but enough has not yet been accomplished.

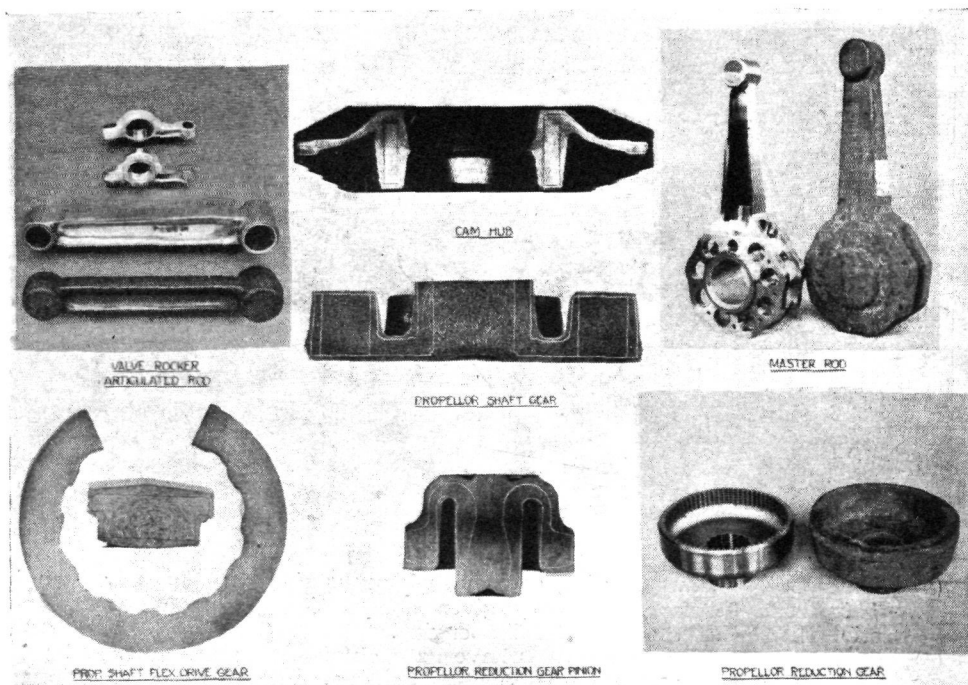
Suitable hardening of highly-stressed parts increases the fatigue range, and chrome molybdenum steel nitrogen hardened, as referred to in a previous section of this paper, has an extremely good fatigue range.

In the continual search for means whereby to reduce the weight per horse-power of aircraft engines, much research work has been carried out on light alloys, with varying results. I am in favour of light alloy forgings for aircraft engines, and hope to see the day when castings are eliminated from all stressed light alloy parts.

When selecting a light alloy material for aero engine design, it is suggested that it is important to consider the creep stress of the material concerned, and some valuable research work along these lines is being carried out at the National Physical Laboratory, and High Duty Alloys, Ltd.



**Fig. 25 : Typical examples of American aero-engine light-alloy forgings.**



Amongst light alloys, those of magnesium naturally assume a prominent position, owing to their extremely low specific gravity, which is of the order of 1.8, as compared with 2.8 of the aluminium base alloys of the duralumin family.

There are at present certain manufacturing difficulties associated with these magnesium alloys, and, during the early days of their development, trouble was experienced with oxidation during casting and forging, but this defect has, I understand, been overcome.

The results obtained with cast magnesium alloys, where scantlings are cut, are disappointing, and, in certain circumstances where stiffness is not essential, it has been found possible to produce as light or lighter castings in aluminium alloy than in magnesium alloy.

The Bristol Company have not had success with magnesium forgings for crankcases. No actual failures have occurred, but distortion, flaking on the faces, loosening of studs, etc., have clearly brought out the very low strength of this material at elevated temperatures.

Magnesium possesses one important advantage when used for small housings of auxiliary drives, inasmuch as it provides better bearing qualities than duralumin, and hardened shafts may be run in it without bushes.

Another metal which is attracting some attention at the moment is beryllium, the specific gravity of which is a little higher than magnesium alloy, namely, 1.93. Although brittle, it has the attractive quality of being extremely hard and having the very high melting point of 1,278 deg. C., as against the 658 deg. C. of aluminium.

When alloyed in small quantities with certain heavier materials, such as copper, it gives remarkable hardening qualities, together with increased resistance to corrosion, and it is along these lines that it is hoped we may expect value from beryllium during the period under review.

Fig. 25 shows typical examples of American light alloy aero engine forgings, and Fig. 26 examples of American steel stampings.

(To be concluded)

## An Aldershot-Farnham aerodrome ?

A CONFERENCE is to take place between representatives of Aldershot Borough Council and Farnham Urban Council on the subject of a proposed joint aerodrome for Aldershot and Farnham.

### Aerodromes in Orkney

SOUTH RONALDSHAY AND BURRAY DISTRICT COUNCIL have been informed by Orkney County Council that they cannot have a county grant towards the cost of an aerodrome in South Ronaldshay Island, as this is a matter of local rather than county interest. Following an aeroplane flight to North Ronaldshay on a day when that

island was cut off by sea, the islanders have decided to bear the cost of laying down an aerodrome big enough to accommodate any size of aeroplane.

### St. Albans landing ground

THE landing ground at St. Albans is now closed, having been sold for building purposes.

### Italian fighting forces estimates

THE Italian estimates for the fighting forces show a reduction of 260,000,000 lire (just over £4,000,000). The expenditure on the Air Force shows an increase of 14,000,000 lire (about £230,000).



# Airport News.

## CROYDON

FROM the newspapers I gather that we have had a week of terrible weather. The daily Press of December 14 came out with headlines such as "Gale Over Britain," "Steamer Feared Lost," "Rescue at Cromer," "Two Lifeboats Launched." It went on to say that several cross-Channel steamers had been cancelled and that Calais-Dover boats had used Folkestone as a port of refuge owing to bad weather. The reports did not, however, refer to this as a (marine) forced landing, as they almost invariably do if a commercial aeroplane puts in at an alternative port for precisely similar reasons. On Monday, December 18, the papers published accounts of Britain being blotted out by fog, ships running ashore and stoppage of traffic owing to five yards' visibility. Throughout all this the air routes operated as usual, serene and untroubled, above the fog, and despite the gales. It makes one think and, according to a well-known travel agent in London, it is making the traveller think. Incidentally, winter passenger bookings have never been so good on the various air lines. It is not only cheaper and quicker to travel by air; it is wiser also.

Lord Londonderry, who doubtless reads his paper, set out blandly by Imperial Airways on Friday morning last, with his family.

An interesting experiment was made on Friday last, when Jack Hylton and his band made an experimental short-wave broadcast from the Imperial Airways' G-AAXC., piloted by Mr. Armstrong, who is, by the way, permanently home from Cairo and flying on the air routes again. A 73-metre short-wave set was used, and was expected to have a range of five miles or so, and the machine therefore circled Baldock Post Office receiving station. The music was picked up there and relayed by land line to the G.P.O. Exhibition in the Strand. At this airport, however, the Marconi Company had a clear reception of the music over what must have been 40 or 45 miles.

Talking about the faith people have in the regularity of the air services in any weather, I may mention that Jack Harris and his band, who were due to play at the Embassy Ball in Paris on Saturday night, took no chances. They went by Imperial Airways on Saturday morning.

It will be interesting to see what sort of inward Christmas mail comes by Imperial Airways on the Empire routes. Outwards from England there have been record mails on both African and Indian-Singapore services, and somewhere between 3½ and 4 tons of Christmas air mail have left this country. There are about 35 letters and postcards to the pound, and you may make your own calculation.

Probably all this made its impression on Mr. James A.

Farley, American Postmaster-General, who came in here by special Imperial Airways' Westland "Wessex" last Friday, piloted by Mr. Gordon P. Olley. The American P.M.G. witnessed the stowage and departure of Saturday's record Christmas air mail, and then flew to Paris on one of the supplementary machines Imperial Airways had to place on service owing to the Christmas rush.

Sir Basil Blackett, who recently flew out to Singapore by K.L.M., returned by the same line and reported favourably of his trip.

Air-France has also been duplicating services, and an amusing incident was the result of over-eagerness to be away on time. A last-minute passenger had to be accommodated, and whilst an employee was altering the documents in the cabin, the pilot took off. He was instructed by wireless not to turn back, and the unbidden guest arrived in Paris minus overcoat and money. His evening in the gay city was a pleasant one, and he returned next morning smiling broadly.

There has been little or no private flying in the vicinity of the Airport of late, and about the only aerial visitor of note, who did not land after all, was a swan which flew over the aerodrome—a most unusual sight!

I see that the question of Customs facilities at Gravesend, which with Gatwick is an alternative bad-weather airport for Croydon, was raised in the House of Commons last week by the Member for Gravesend. The reply that the Commissioners of Customs were prepared to grant outward clearance of passengers and their personal luggage should not have been taken as satisfactory. Air traffic companies carrying a large proportion of British manufactured goods out of this country by air can scarcely regard these urgent, valuable and perishable goods as of less importance than their passengers, and leave them dumped at Gravesend when passengers can be flown away. Besides, H.M. Customs regard an inward landing at Gravesend as a technical forced landing, and inward freight, imported by the foreigner, can be brought to Croydon at once in sealed vans under bond and can be cleared and delivered immediately.

Gatwick is to have full Customs clearance facilities inwards and outwards, and Gravesend must have the same.

There has been some correspondence in one of the "dog" papers about dogs travelling by air arriving deaf. It was quite obvious that the puppy mentioned did not have its hearing affected by the air journey, and the testimony of hundreds of regular exporters of dogs by all the different companies operating in and out of Croydon could be brought to show that dogs travel better and arrive fitter by air than by any other means of transport.

A. VIATOR.

## FROM HESTON

THE Marquess of Londonderry, Secretary of State for Air, who gained his private pilot's licence at Heston this summer, is evidently no fair-weather pilot. On December 12, when the fog closed in to a radius of some 500 yards, he had thirty minutes' dual instruction with Capt. Baker, and was the only pupil of the Airwork School to fly.

Lady Drummond-Hay, pilot and journalist, had bad luck at Abbeville, where she arrived from Heston on December 9, en route to Cairo for the Oases Meeting. Her Waco was being wheeled out of the hangar next day, when the tip of the propeller, which was in a vertical position, caught on a concrete block which was built into the ground for securing the hangar doors, and was badly splintered. She rang up Heston, and Capt. Ferguson flew an engineer, Mr. Madel, straight out to Abbeville with a new "prop." Capt. Ferguson, who was busy with school navigation work, flew back to Heston the same evening, and landed by floodlight at 4.50 p.m., leaving Mr. Madel to fit and test the new propeller and to accompany Lady Drummond-Hay as far as Paris to check up its performance in actual flight.

On December 17, Miss Benita Hume, the film actress,

christened the latest addition to the British Air Navigation Co.'s fleet—a Ford 5A.T. trimotor all-metal 11-passenger monoplane, equipped with wireless, which will be used principally on charter work, including a fortnightly service to Sestrieres, the Italian winter sports centre.

To combat the cold winds now prevailing, Airwork have installed on trial a new type of oil burner which is for all practical purposes omnivorous, even by-products from the paint shop appearing as a clear flame. Compared with this, the surplus oil from an aero engine is nectar to the infernal machine, whose slogan, "Calories for the Club-house," is just perceptible to the trained ear listening in to its thermogenetic and comfortable hum.

On one day last week, six different types of American aircraft were counted at Heston—Mr. F. Francis's Sikorsky Amphibian, Lady Drummond-Hay's handsome Waco, Mr. Loel Guinness's Bellanca, the British Air Navigation Company's new Trimotor Ford, a Stinson and an Aeronca belonging to Mr. Roderick Denman.

On December 9, Birkett Air Service flew in three machines to the Whitchurch fire, carrying Press photographers.



# Clirisms from the Four Winds.

## **Col. Lindbergh's Flight ended**

COL. AND MRS. LINDBERGH, continuing their flight, arrived at Port of Spain, Trinidad, on the afternoon of Tuesday, December 12, from Manaos, Brazil. Two days later, Thursday, December 14, they arrived at San Juan, Porto Rico, after flying the 753 miles from Port of Spain in 5 hr. 40 min. On Saturday, December 16, they arrived at Miami, Florida, thus bringing to an end their five months' aerial tour.

## **French Flight across Sahara**

THE 28 French machines which, under the command of Gen. Vuillemin, are making a flight round French Africa, have flown the Sahara in formation. Leaving Gao, French West Africa, on December 12, they landed at re-fuelling post No. 5, in the heart of the desert, and then flew on to Adrar, 800 miles north of Gao.

## **Kingsford Smith for Tokio**

AIR COMMODORE SIR CHARLES KINGSFORD SMITH is to pilot a machine carrying Mr. Latham, Australian Minister for External Affairs, to Tokio in February.

## **R.A.F. West African flight**

THE three Vickers "Victorias" of No. 216 (Bomber Transport) Squadron which are doing a service flight to West Africa, arrived at El Fasher, Dafur, on Tuesday, December 12, on their way home to Heliopolis.

## **Viceroy's trophy air race postponed**

THE Indian Aero Club has decided that the next annual air race for the Viceroy's Challenge Trophy should be postponed from February until about November, in order to enable the Irwin Flying Fund, which provides most of the prize money, to accumulate interest on the capital invested. A second reason for the postponement is that the race from London to Melbourne will be held towards the end of October, and it is hoped that some of the competitors will enter for the Viceroy's Cup on their way back to Europe. It is also felt that holding the race during the cold weather in future will give the authorities a better opportunity for fixing on a suitable place. They have already decided that the venue of the race next year will not be Delhi. No station has yet been fixed and, although nothing definitely has yet been settled, it is possible that the next race will either be in Bombay or Calcutta.

## **Lost French airman**

LITTLE hope can now be entertained for the safety of the Viscount Charles de Manneville, who has been missing since Wednesday, December 13. He left Croydon at 9.30 in the morning, was seen passing over Lympe 45 min. later, and has not since been heard of. On Friday, December 15, an Air Ministry official visited Dungeness and took charge of wreckage which had been washed up there. It is believed that this may be the wreckage of Viscount Manneville's machine.

## **Master of Sempill home**

COL. THE MASTER OF SEMPILL arrived back in England in the White Star liner *Majestic* on December 15. Although well on the road to recovery, he states that he will have to take things quietly.

## **Machine lost in Mediterranean**

A SEAPLANE which was flying from Marseilles to Algiers sent out an SOS from over the Mediterranean in the early morning of Sunday, December 17, to the effect that it had developed engine trouble. It alighted on the water 34 miles south-west of Marseilles, and in the evening again sent out wireless calls for help. Owing to the poor visibility the machine was not found until 21 hours later, when the passengers and mail were taken off, but the machine itself had to be abandoned.

## **A change of mount**

MR. CHARLES GARDNER has left Hamble to attend the Air Meeting at Cairo in his Avro "Cadet" ABYC, accompanied by Mr. Hollins, and will not, as originally reported, compete in the Oasis Air Race with the "Monospar."

## **German air crash**

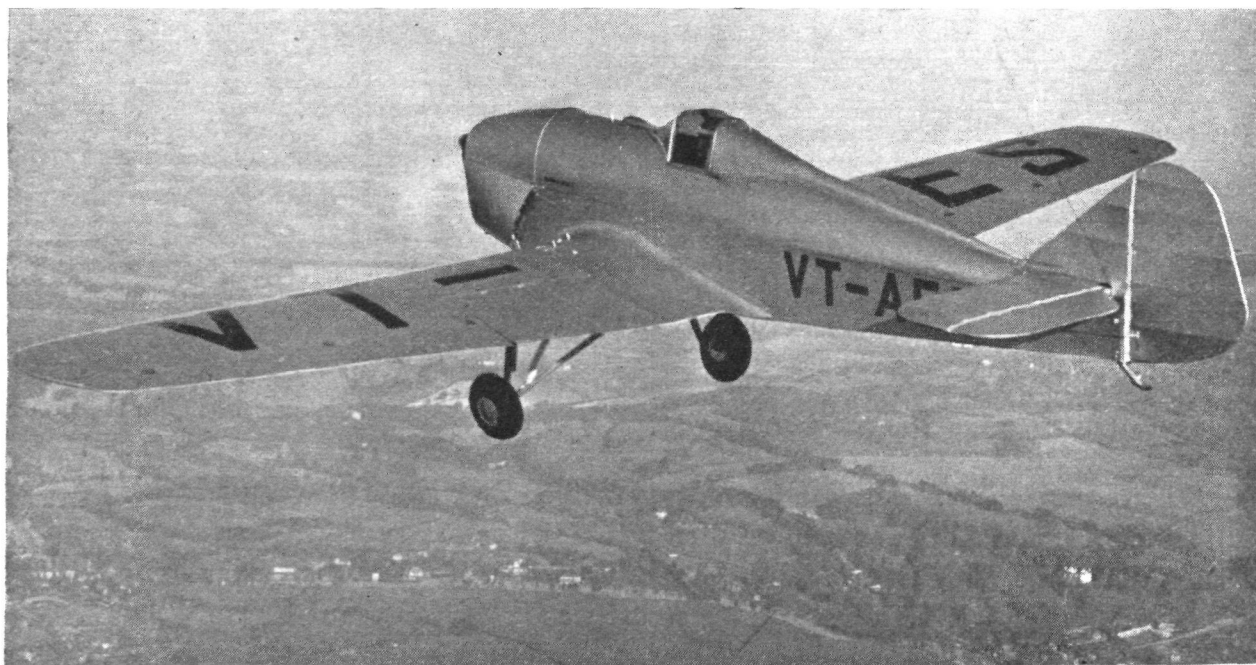
As a result of a crash of a German machine at Hamburg, on Monday, December 11, six persons were killed. Apparently the machine hit an obstacle while attempting to land.

## **Big orders for Gourdou-Leseurre**

SUPPLEMENTING an order for 25 "812" seaplane fighters ("Jupiter"), the Societe Gourdou-Leseurre has received a contract for 22 machines of the "832" type. These will be fitted with either 360-h.p. Hispano-Suiza or Gnome-Rhone K.9 engines.

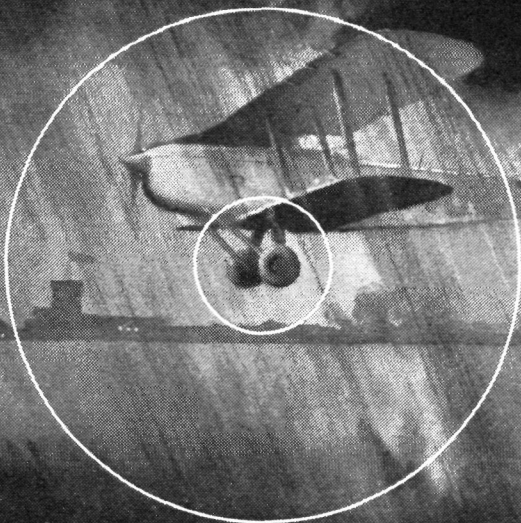
## **A new altitude record with a British engine**

THE altitude record for light aeroplanes in the third



AN INDIAN VENTURE : Mr. Man Mohan Singh, chief pilot to the Maharajah of Patiala, and who flew from England to India in 1930, is making a flight from England to Cape Town in the Miles "Hawk" ("Hermes IV") shown in the accompanying illustration. This machine has been fitted with large tanks giving a range of about 1,800 miles. Mr. Singh, who has been provided with a Shell Carnet to enable him to obtain Shell aviation products wherever he goes, will follow the normal route through Italy and along Imperial Airways' route. From the Cape he will return to India via Egypt.

confidence means safe landing

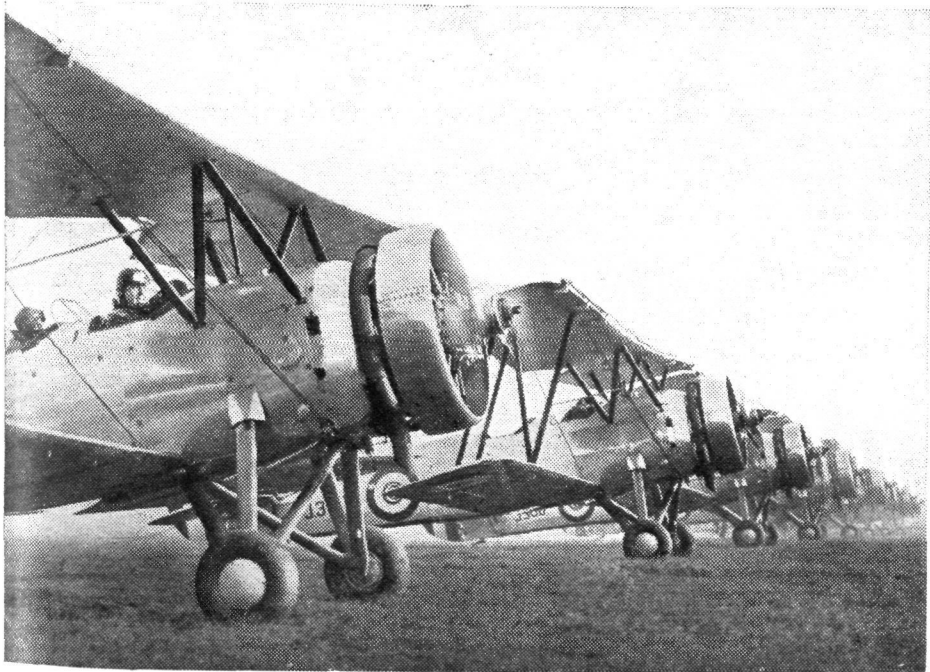


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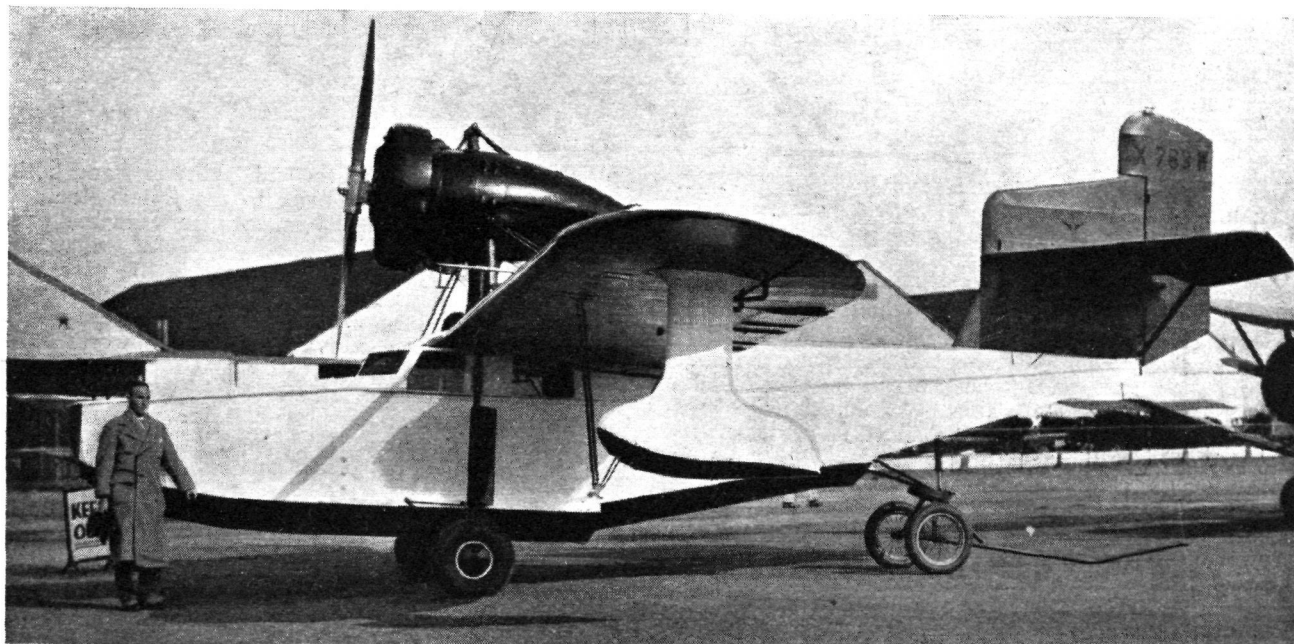
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**A FAST AMPHIBIAN:** This is the latest machine, designed by Grover Loening. It is claimed to be the fastest amphibian in the world, but trailing edge flaps also provide low landing speed.

F.A.I. category (multi-seaters weighing under 280 kg.) has been beaten by Giovanni Zappetta, who carried as a passenger Francesco Ragusa, in a Nuvoli N.5 machine fitted with a Pobjoy engine. The previous record was also held by Italy with 22,559 ft.

#### **The latest American service types**

THE Grumman FF-I two-seater fighter (600 h.p. Wright "Cyclone") has been put into service use with the U.S. Navy. The wheels retract upwards into, and lie flush with, the sides of the fuselage. Biplanes with retractable undercarriages are, it seems, interesting the American Army and Navy at the present time. The Curtiss "Raven" observation machine employs an undercarriage somewhat similar to that of the Grumman. The FF-I is manufactured by the Grumman Aircraft Engineering Corporation, of Farmingdale, L.I., N.Y.

The first Boeing 26A single-seater fighter of a batch of 111 which has been ordered for the U.S. Army Air Corps has recently been tested at Seattle. A top speed in the neighbourhood of 230 m.p.h. is claimed when the machine is fitted with a supercharged "Wasp" engine.

#### **The "Air Flivver" again**

WE understand that William ("Bill") Stout is working on a small machine intended for quantity production at his laboratory near Dearborn, Michigan. Owing to the proximity of the Ford factory, developments are awaited with interest.

#### **The Schreck works close down**

FOLLOWING a strike of the employees, it is announced that the works of the Société Schreck have been closed. The company has been in financial difficulties for some time past. Orders totalling several million francs had been received by the company, and it is expected that the factory will be reopened in the near future either by M. Schreck or some financial group.

#### **A Bernard bomber**

THE Bernard type 81 G.R. monoplane as used by Assolant and Lefèvre in their recent attempt to beat the long-distance record has been developed into a long-range bomber with the type number 82 B.3. When fitted with the Hispano-Suiza 12Xbrs. 690-h.p. engine, the top speed is expected to be more than 186 m.p.h. The useful load is given as 3,968 lb. and the range as 1,780 miles.

#### **Winged "Black Marias"**

AEROPLANES were employed recently in Canada for the transporting of prisoners to jail. Sixty lumberjack strikers were flown to the Ville Marie, Quebec, four machines making three flights each, and the pilots being sworn in as special constables.

#### **Brighton, Hove and Worthing Joint Municipal Airport**

THE plans and general layout of the proposed Brighton, Hove and Worthing Joint Municipal Airport, which it is proposed to construct at Shoreham, Sussex, have been prepared by Mr. Stavers H. Tiltman, L.R.I.B.A., the Brighton architect, in consultation with Mr. M. H. Volk, A.F.R.Ae.S., of Southern Aircraft, Ltd., and the complete scheme has now been approved by the

Joint Airport Committee. Mr. Tiltman, who has been officially appointed architect to the scheme, has retained the services of Mr. Nigel Norman, B.A., A.F.R.Ae.S., of Airwork, Ltd., Heston, as his consultant, and the work will be proceeded with as soon as the sanction of the Ministry of Health has been obtained.

#### **New aerodrome for Frankfurt**

SO great has been the increase of air traffic at Frankfurt during the past few months that it has been decided to lay down a new aerodrome. Besides being much larger than the present one, it will have facilities for night landings.

#### **The list grows**

IN connection with the list of towns which have purchased sites for aerodromes, published in our issue of December 7, we have been asked to add two—Hastings and Rochester. Mr. Sidney Little, Borough and Water Engineer of Hastings, writes to point out that land for an aerodrome was purchased some months ago, and that plans are in preparation for the development of the site. Mr. J. Wood, of Short Brothers, points out that the Rochester Corporation has purchased a site of 167 acres situated about two miles south of Rochester. The work of levelling is well in hand, and it is hoped to have the site completed within a few weeks. A hangar capable of housing the largest type of aircraft is being erected by Short Brothers.

#### **Argentine Honour for Mr. Mollison**

THE Argentine Aero Club have awarded a gold medal to Mr. J. A. Mollison in recognition of his flight from England to Buenos Aires in February last. This medal was presented to Mr. Mollison by the Duke of Athol, the President of the Royal Aero Club, at the Aero Club on Friday, December 15, in the presence of the Argentine Ambassador. In his speech, the Duke of Athol mentioned that the medal constituted the highest recognition that can be given from the Argentine, and is only awarded to such aviators who have performed exceptional flights.

#### **The successor of Herr von Hoepfner**

RECENTLY we published a paragraph which stated that Herr Gerd von Hoepfner had resigned from his duties with the German Aeronautical Association. We now gather from the *Shell Aviation News* that his successor will be Hauptman a E. Loerzer, and not Herr von Gronau as was previously stated.

#### **"Going by Rail"**

MOST pilots have at some time or other made good use of a railway line to guide them to their destination. In fact "Going by Rail" or "By Bradshaw" is quite a common saying to describe following a railway. A French pilot, M. Maurice Poamet, has now suggested an improvement. Instead of an occasional gasometer or railway station bearing the name of a town, why, he asks, should not the names of towns be placed in large enamelled letters between the rails? If that were done systematically, no pilot need ever be lost for very long. The problem seems to be who should pay for these letters. The railways can hardly be expected to foot the bill.

# Book Reviews.

*A Short Course in Elementary Meteorology.* By W. H. Pick, B.Sc., F.C.P., R.Inst.P. Printed and published by His Majesty's Stationery Office, Adastral House, Kingsway, London. Price 2s. 6d. net.

THIS is the fourth edition of this extremely useful little book. It is invaluable to a pilot whether he be in the Service or a civilian. Its chief attribute is its simplicity, yet it is extremely comprehensive, so much so that the Met. examination for a "B" licence can be passed on a study of this book alone. This 1933 edition does not differ much from the one last produced; parts of it, however, have been brought up to date. The International Weather Charts Symbols are more extensive, several new ones having been introduced during the last year or two. Much new knowledge has come to light concerning the formation and movement of depressions, and these latest theories have been included. Experience is teaching Met. experts more about forecasting each year, so it is but natural that a little more space has been given to this, perhaps the most important, side of meteorology. It is pleasing to note that the very attractive little chapter on Weather Lore has not been omitted; the old weather maxims may not be altogether accurate, but they are very attractive and not without certain common sense.

*Airman's Escape.* By Hermann Köhl, translated from the German by Claud W. Sykes. (John Lane the Bodley Head, Ltd.) Price 9s., post free. Obtainable from FLIGHT Offices.

CAPT. KÖHL is a man who is interesting to everybody because he, in company with Commandant Fitzmaurice and Baron von Hünefeld, made the first flight across the Atlantic from East to West. Therefore, we are glad to learn some more about him, and in this book he has told his story from the outbreak of war. Also the book is welcome as giving us some account of the doings of German night-bombing aircraft during the war. Their tale is not at all the same as that of fighters like von Richthofen and Boelke.

In the bombing squadrons the pilot was almost invariably a sergeant, while the officers were observers, navigators, and bomb-aimers. Capt. Köhl learnt to pilot a machine, but he learnt unofficially. Also, when he got command of a Staffel on the Somme front during the British offensive, he introduced night-flying on his own responsibility, although he says "most of my pilots were incredibly youthful and inexperienced. They had only just learnt to fly and could hardly bring off a proper landing in daylight." He frankly admits the British superiority in the air during the Somme battles. "Whenever we encountered enemy scouts, we were inferior to them in armament and could only escape destruction by going into steep turns and hiding in the clouds." Later on he bombed a big ammunition dump at Blargies, near Amiens, on May 9, 1918, and was rewarded with the "Pour le Merite," the German equivalent to the Victoria Cross. Then he tried to bomb Paris, but was caught in searchlights and an "Archie" put one of his engines out

of action. His pilot had to land in France, and both men tried to make their way back to the trench line. Both were caught after some adventures and became prisoners of war.

There is a fairly long account of his life as a prisoner and his many plans for escape. It was some time after the Armistice had been signed that he actually got out of his prison—one wonders was it really worth it!—and after a week's adventures reached the Rhone and swam across into Switzerland. This is the episode which gives the book its title, and it is well told. The escape, however, seems to have been fairly simple, and one cannot but suppose that the French did not care very much, as the war was over.

Finally, Capt. Köhl tells the story of his Atlantic flight. That story was told three times in the book, "The Three Musketeers of the Air," each of the three of the *Bremen's* crew giving his own account. This fourth account is certainly superfluous.

This book is very well translated, and is quite readable, but it is not a very valuable addition to a war library; and, to be frank, Capt. Köhl does not succeed in making the reader fall deeply in love with the personality of the autobiographer.

F. A. DE V. R.

*Jane's "All the World's Aircraft."* (Sampson Low Marston & Co., Ltd.) Obtainable from FLIGHT Office. Price 43s., post free.

WE can do no better in describing "All the World's Aircraft" than to quote the inscription on the jacket of this year's volume, "A complete record of aeronautical progress throughout the world during the past year." For twenty-three years "Jane's" has come as a boon and a blessing to those who like to know just how far the rest of the world is behind or in front of us in affairs of aviation. Each year the material for inclusion must grow more profuse, and with all sincerity we "hand it to" those responsible for the production of this annual.

We are told in the preface that the U.S. Army and the U.S. Navy Bureaux have instituted "Secret Lists" and "Part Publication Lists" which prohibit the publication of the performance figures of military types until the machines have been in production for one year. Of the Curtiss "Shrike" Attack machine we are told that there are "no data available." A very complete performance table of the "Shrike" was given in last year's "Jane's." The "slips," however, seem fewer than last year. The performance figures of some of the French fighter types which were entered for the recent competition are of extreme interest; the winner of the competition, the Dewoitine D.500, has an amazing performance. If only performance data of the Hawker "Super-Fury" were available!

On looking through the book, one is left optimistic for the coming year. As the editor of "Jane's" puts it, "This particular year's volume may be regarded as indicating the corner round which aviation had to turn before it could start on the road to ultimate success." It may be only the proximity to Christmas which is buoying us up, but we must say that we are inclined to agree.



## A new map of the Middle East

JOHN BARTHOLOMEW & SON, of 12, Duncan Street, Edinburgh, have produced a very useful little map of the Middle East, including Turkey, Egypt, Palestine, Transjordan, the Levant States, Arabia, Iraq and Persia. This map is in contour colouring with roads, railways and tracks. A novelty is the marking of aerodromes and landing grounds with little red aeroplanes, quite simple but very useful, though if Bartholomew's had it in mind to cater for pilots, and this map as it stands would be very useful to them, they might have marked wireless stations and whether petrol and oil were obtainable, which could have been done with very little extra trouble. The map is scale 1:4,000,000, and the cost 6s. net.

## Carriage by Air Act, 1932

(1) THE ratification by the President of the German Reich of the Convention for the Unification of Certain Rules relating to International Carriage by Air, signed at

Warsaw on October 12, 1929, and of the additional protocol thereto, was deposited on September 30, 1933. The Convention will therefore, in accordance with Article 37 (2), come into force on December 29, 1933, as between the President of the German Reich and the High Contracting Parties who had previously ratified it. The High Contracting Parties who had previously ratified the Convention are those referred to in the Carriage by Air (Parties to Convention) Order, 1933 (S.R. and O. 1933, No. 543) (copies of which may be obtained direct from H.M. Stationery Office at Adastral House, Kingsway, London, W.C.2, and other addresses, or through any bookseller, price 1d. net or 2d. post free), and, in addition, Her Majesty the Queen of the Netherlands, the deposit of whose ratification was notified in Notice to Airmen, Series A, No. 67, of 1933.

(2) Copies of the "Carriage by Air Act, 1932," which includes the text of the above-mentioned Convention, can be obtained direct from H.M. Stationery Office, or through any bookseller, price 3d. net or 4d. post free.

# THE ROYAL AIR FORCE

London Gazette, December 12, 1933

## General Duties Branch

Flt. Lt. J. H. Edwardes Jones is placed on half-pay list, scale B, from Oct. 3 to Dec. 5 inclusive. (Substituted for Gazette, Oct. 10.)

## Chaplains Branch

The Rev. S. L. Clarke, M.A., B.Sc., relinquishes the appointment of Chaplain-in-Chief and his appointment as Hon. Chaplain to the King (Dec. 11). The Rev. J. R. Walkey, M.A., is appointed Chaplain-in-Chief and is granted the relative rank of Air Commodore (Dec. 11); the Rev. W. P. Hughes, L.Th. is granted a permanent commn. (Dec. 11); the Rev. S. L. Clarke, M.A. B.Sc., is placed on retired list (Dec. 11).

## ROYAL AIR FORCE RESERVE RESERVE OF AIR FORCE OFFICERS

### General Duties Branch

H. J. Raymond is granted a commn. as Pilot Officer on probation in class A (Nov. 3); H. P. Seras (Lieut., R.N. Ret.) is granted a commn. as Flying Officer in class A (Nov. 16); P/O. D. G. Ross is promoted to rank of Flying Officer (Nov. 1); Flt. Lt. P. G. Tweedie is transferred from class A to class C (Sept. 11); P/O. on probation J. D. Gardiner is transferred from

class AA (ii.) to class C (Dec. 10); F/O. D. F. Cox relinquishes his commn. on completion of service and is permitted to retain the rank of Flt. Lt. (June 3); F/O. E. J. B. Langhorne relinquishes his commn. on completion of service (July 23); F/O. J. Vivian relinquishes his commn. on account of ill-health (Dec. 13).

## Medical Branch

Flt. Lt. R. A. W. Kerr, M.B., relinquishes his commn. on completion of service (Nov. 22).

## SPECIAL RESERVE

### General Duties Branch

J. Edwardes is granted a commn. as Pilot Officer on probation (Dec. 13).

## AUXILIARY AIR FORCE

### General Duties Branch

No. 600 (CITY OF LONDON) (BOMBER) SQUADRON.—Flt. Lt. A. B. Ferguson relinquishes his commn. on completion of service (Nov. 1, 1932).

No. 601 (COUNTY OF LONDON) (BOMBER) SQUADRON.—R. A. E. Luard is granted a commn. as Pilot Officer (Nov. 24).

No. 608 (NORTH RIDING) (BOMBER) SQUADRON.—F. O. G. H. Ambler is promoted to rank of Flt. Lt. (Nov. 25).

## ROYAL AIR FORCE INTELLIGENCE

**Appointments.**—The following appointments in the Royal Air Force are notified:—

### General Duties Branch

**Wing Commander** W. Sowrey, D.F.C., A.F.C., to Air Armament School, Eastchurch, 4.12.33, for Administrative duties, vice G./Capt. R. M. Field.

**Squadron Leader:** H. S. P. Walmsley, M.C., D.F.C., to No. 33 (B.) Sqdn., Bicester, 18.11.33, to Command, vice Sqdn.-Ldr. R. A. George, M.C.

**Flight Lieutenants:** C. N. Ellen, D.F.C. (since promoted) to No. 5 (A.C.) Sqdn., Quetta, India, 21.11.33. C. F. H. Grace, to R.A.F. Depot, Middle East, Aboukir, 20.11.33.

**Flying Officers:** D. V. Johnson, to No. 47 (B.) Sqdn., Khartoum, 18.11.33. W. E. Oulton, to Station H.Q., Hal Far, Malta, 29.11.33. S. C. Widdows, to No. 47 (B.) Sqdn., Khartoum, 18.11.33. D. P. Lascelles, to No. 24 (Communications) Sqdn., Hendon, 24.11.33.

**Pilot Officers:** H. Stanton, to No. 216 (B.T.) Sqdn., Heliopolis, Egypt, 18.11.33. C. Broughton, to No. 11 (B.) Sqdn., Risalpur, India, 13.11.33. B. H. Becker, to No. 2 (A.C.) Sqdn., Manston, 19.11.33. A. F. R. Sennett,

to No. 4 (A.C.) Sqdn., S. Farnborough, 19.11.33. A. J. Kennedy, to No. 4 (A.C.) Sqdn., S. Farnborough, 19.11.33. W. B. Murray, to No. 2 (A.C.) Sqdn., Manston, 19.11.33.

**Acting Pilot Officer:** P. C. Hilton, to No. 12 (B.) Sqdn., Andover, 18.11.33.

### Stores Branch

**Flight Lieutenants:** J. W. Mitchell, to No. 4 Flying Training School, Abu Sueir, Egypt, 20.11.33. E. G. Mack Charleson, to Station H.Q., Duxford, 12.12.33. H. J. Payne, to Station H.Q., Farnborough, 11.12.33.

**Flying Officers:** L. H. Anness, A.F.C., to H.Q., Iraq Command, Hinaidi, 10.11.33. J. W. Hustwaite, to No. 216 (B.T.) Sqdn., Heliopolis, Egypt, 20.11.33. V. H. B. Roth, to Aircraft Depot, Iraq, Hinaidi, 10.11.33.

### Accountant Branch

**Flying Officer:** K. Fraser, to No. 84 (B.) Sqdn., Shaibah, Iraq, 10.11.33. R. D. Pratt, to Station H.Q., Hinaidi, 10.11.33.

### Medical Branch

**Flight Lieutenant** G. S. Strachan, to No. 25 (F.) Sqdn., Hawkinge, 7.12.33.

## R.A.F. College, Cranwell

The following are extracts from the Report of the Commandant of the Royal Air Force College, Cranwell, Air Vice-Marshal W. G. S. Mitchell, C.B.E., D.S.O., M.C., A.F.C., at the Passing-Out Inspection of Flight Cadets, December, 1933.—The inspection was carried out by Marshal of the Royal Air Force Lord Trenchard, G.C.B., D.S.O.

The present strength of the College is 118, and since the formation of the College, including the present IV Term, 677 Flight Cadets have graduated.

Eleven of the Flight Cadets passing out are going to Day Bomber Squadrons, five to Fighter, two to Army Co-Operation, six to Flying Boats, and three to Night Bomber Squadrons. Flight Cadets who are going to Day Bombers have been trained on "Hart" and "Atlas" types, and those going to Fighter Squadrons have been trained on "Siskin" and "Bulldog" types. In addition, Flight Cadets who are going to Fighter Squadrons equipped with "Fury" aircraft have been given a short period on "Hart" aircraft so as to familiarise them with water-cooled engines. Flight Cadets going to Night Bomber Squadrons have been given a short experience in flying twin-engined aircraft.

The standard of flying is good, and the Flight Cadets passing out have averaged 75 hours dual and solo on service types and 154 hours dual and solo on all types during their course.

The usual courses of instrument flying and cross-country work have been completed, and the Flight Cadets passing out have averaged eight long cross country flights, whilst those of the junior terms have already done two or three, with the exception, of course, of the I Term, who are not yet sufficiently advanced.

We have received the first instalment of "Bulldog" aircraft, which are going to replace "Siskins," and it is hoped shortly to have a complete Flight of "Bulldogs."

As regards ground studies, it is pointed out that this term the revised syllabus was first put into operation and has proved satisfactory.

The new R.A.F. College building was occupied at the beginning of this term, and all the arrangements have worked satisfactorily. Much work still remains to be done around the outside of the building, but it is hoped that the whole area will be tidy and levelled by the early spring.

In the new building each Flight Cadet has a separate quarter and, consequently, facilities for private study are much improved.

Almost certainly owing to the improved housing conditions in the new building, the health of the cadets during the past term has shown considerable improvement, and there have been far fewer instances of sickness due to colds and minor complaints. The number of cadets admitted to hospital was 42 as compared with 74 admitted during the corresponding period of last year.

As regards Physical Training and Games, we have worked through a large programme as usual in this important branch of the training.

The Sword of Honour, presented to the best all-round Flight Cadet, in the Senior Term, has been awarded to:—Flight Cadet Under-Officer Geoffrey Charles Eveleigh.

The prize awarded to the Flight Cadet in the Senior Term obtaining the highest marks in Humanities has been awarded to:—Flight Cadet Corporal Michael Dawnay.

The prize awarded to the Flight Cadet in the Senior Term obtaining the highest marks in Aeronautical Engineering has been awarded to:—Flight Cadet Corporal Conrad Charles Francis.

The Abdy Gerrard Fellowes Memorial Prize, for the Flight Cadet obtaining the highest marks in Mathematics and Science, has been awarded to:—Flight Cadet Corporal Conrad Charles Francis.

The J. A. Chance Memorial Prize, awarded to the Flight Cadet in the Senior Term obtaining the highest marks in Service Subjects, has been awarded to:—Flight Cadet Corporal Conrad Charles Francis.

The R. M. Groves Memorial Prize, for the best all-round pilot in the Senior Term, has been awarded to:—Flight Cadet Corporal Michael Dawnay.

## Royal Air Force Squadrons (see page 1279)

OTHER descriptive articles concerning the work of various R.A.F. Squadrons, etc., have been published in FLIGHT as follow:—

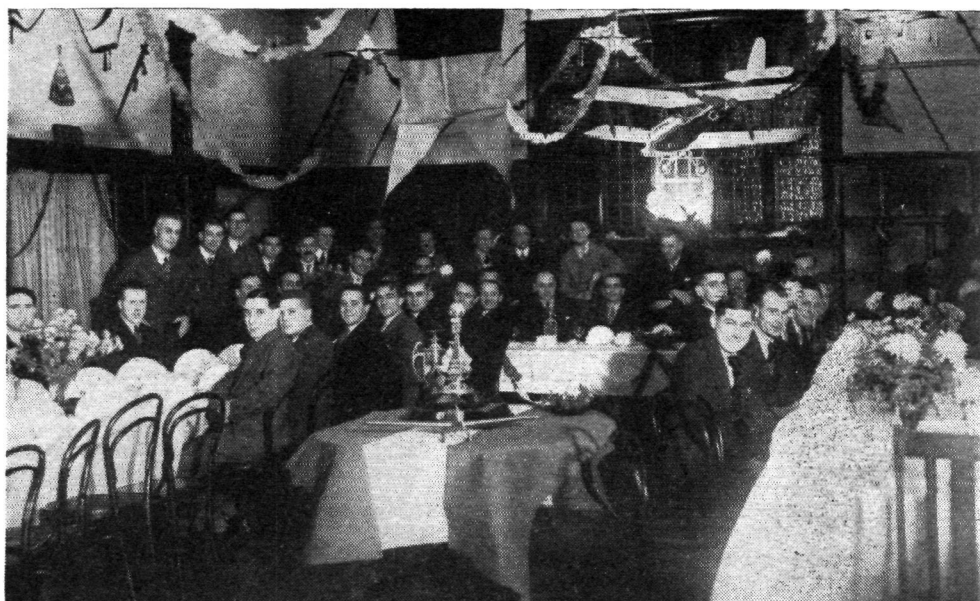
- H.M. Aircraft Carrier *Glorious*. May 16, 1930.  
No. 4 (Army Co-operation), South Farnborough; No. 17 (Fighter), Upavon; and No. 33 (Bomber), Eastchurch. June 27, 1930.  
No. 601 (County of London) (B.) Sq., A.A.F. (at Lympne). August 15, 1930.  
No. 43 (Fighter) Sq. (Tangmere). September 19, 1930.  
No. 2 (Army Co-operation) Sq. (Manston). December 19, 1930.  
No. 101 (Bomber) Sq. (Andover). April 24, 1931.  
Nos. 240 and 209 (Flying-Boat) Sq. (Mount Batten). June 12, 1931.  
"1890-1912-1931." (An outline of the Growth of the R.A.F.) June 26, 1931.  
Cambridge University Air Sq. (at Old Sarum). July 10, 1931.  
Central Flying School (Wittering). July 17, 1931.  
Submarine Aircraft Carrier "M.2." July 31, 1931.  
Oxford University Air Sq. (at Eastchurch). August 7, 1931.  
No. 600 (City of London) (Bomber) Sq., A.A.F. (at Tangmere). August 21, 1931.  
No. 605 (County of Warwick) (Bomber) Sq. (Cas. Bromwich). April 1, 1932.  
No. 40 (Bomber) Sq. (Upper Heyford). May 13, 1932.  
Nos. 7 and 58 (Bomber) Sq. (Worthy Down). June 10, 1932.  
A visit to H.M.S. *Exeter* of 2nd Cruiser Squadron, Home Fleet. June 17, 1932.  
Oxford University Air Sq. (Eastchurch). July 22, 1932.  
Cambridge University Air Sq. (Netheravon). August 5, 1932.  
No. 1 Air Defence Group (A.A.F. and Cadre Sq.). August 12, 1932.  
No. 100 (Bomber) Sq. (Donibristle). August 19, 1932.  
Scotland's Auxiliaries; No. 602 (City of Glasgow) (Bomber) Sq. and No. 603 (City of Edinburgh) (Bomber) Sq. September 16, 1932.  
London's Auxiliaries; Nos. 600, 601, and 604 B. Sq. October 20, 1932.  
No. 25 (Fighter) Sq. (Hawkinge). December 8, 1932.  
No. 19 (Fighter) Sq., (Duxford). January 5, 1933.  
Aircraft Carrier H.M.S. *Courageous*. January 12, 1933.  
Lee-on-Solent. February 9, 1933.  
No. 23 (Fighter) Sq. March 2, 1933.  
Gosport. The Fleet Air Arm Base. March 30, 1933.  
Larkhill. R.A.F. Balloon Centre. June 8, 1933.  
The R.A.F. Staff College, Andover. July 20, 1933.  
No. 99 (Bomber) Sq. (Upper Heyford). August 3, 1933.  
No. 26 (Army Co-operation) Sq. (Catterick). August 10, 1933.  
No. 3 Flying Training School, Grantham. August 17, 1933.  
No. 1 (Fighter) Sq. September 7, 1933.  
No. 207 (Bomber) Sq. (Bircham Newton). October 12, 1933.  
No. 502 (Ulster) (Bomber) Sq. November 23, 1933.



# THE BROOKLANDS WORKS DINNER

**A**T the close of a good year's work the Brooklands School of Flying held its Annual Works Dinner at the White Lion Hotel, Cobham, on Friday, December 15. Over 80 employees and pupils were there. The speeches contained just the right mixture of facts, figures and fun called for by a dinner of this nature. We must confine ourselves, unfortunately, to recording some of the facts and figures. According to Capt. Duncan Davis, the flying time for the year totals 3,000 hours (which is about twice as much as last year), and the Service Department, under Mr. Massey, has dealt with 220 machines. Brooklands, Northampton and Lympne between them have trained 150 pilots.

Obviously the employees hold their directors and departmental "bosses" in high esteem. We could well believe Mr. Erik Nelson when he told us how sorry he will be to leave Brooklands, when, next



**A FAMILY PARTY:** Duncan Davis, J. W. Massey, George Lowdell, "Max" Findlay, "Bill" Thorn and "Tommy" Rose may be described. (FLIGHT Photo.)

March, he will go out to Hong Kong to fill a very responsible post. He will issue C. of A.'s and flying licences and inspect any crashes which may occur.

## The Schoolboys' Own Exhibition

No Exhibition does more to make people air-minded than the Schoolboys' Own, which this season takes place at the Great White City, December 28 to January 13, 1934. An interesting feature is the grouping of an actual Sopwith "Camel" beside a Hawker "Fury," with a plan of the Western Front. Many types of aeroplanes will also be on view. Fathers may now take their sons and show them what they did in the Great War! There are over 220,000 sq. ft. of exhibits. Flying films never before displayed will be shown in the British Gaumont Talking Cinema, immediately to the left of the main entrance to the Schoolboys' Own Exhibition; also a Model Air Circus.

## K.L.G. Wizard Plugs

THE proprietors of Wizard Sparking Plugs, Ltd., announce that arrangements have now been completed whereby K.L.G. Sparking Plugs, Ltd., will undertake the manufacture, under licence, and sale of the Wizard Plug. In future the plug will be known as the K.L.G. Wizard. This plug, which is now used exclusively by Imperial Airways in all their engines and on all their routes, covering over 12,000 miles, is patented in Great Britain and most foreign countries, and by the arrangements referred to above, Wizard users will now have the full benefit of the unique experience of K.L.G. in the production of sparking plugs for aircraft. Imperial Airways' experience over the past year can leave no doubt as to the advance which the Wizard plug marks, and K.L.G. are already in a position to give early delivery, and answer inquiries. All inquiries for export should be addressed to Smith's Aircraft Instruments, 185, Great Portland Street, London, W.1.

## Customs facilities at Gravesend Airport

PERMISSION by H.M. Customs to Gravesend Airport to clear passengers outwards as well as inwards has just been granted, and it will be readily seen the immense practical use which both private owners and private aircraft can make of the concession. Gravesend Airport is only fifty minutes from the West End by either train or coach, and those pilots who have already visited Gravesend Airport will readily realise that this is the final touch to the very efficient services already provided by the aerodrome. To those who have not yet visited the aerodrome, we should like to point out that there are fully equipped workshops for repairs to both aircraft and engines—a hangar nearly completed big enough to house the largest commercial aeroplanes—and a club-house which is provided with sleeping accommodation and all restaurant facilities. It is earnestly hoped that private owners and air transport operators will use these services as often as possible and take full advantage of the newly acquired Customs facilities.

## IMPORTS AND EXPORTS

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910).

For 1910 and 1911 figures see FLIGHT for January 25, 1912.

For 1912 and 1913, see FLIGHT for January 17, 1914.

For 1914, see FLIGHT for January 15, 1915, and so on yearly, the figures for 1932 being given in FLIGHT, January 19, 1933.

	Imports		Exports		Re-exports	
	1932.	1933.	1932.	1933.	1932.	1933.
	£	£	£	£	£	£
Jan. ..	2,456	2,073	122,942	82,963	863	827
Feb. ..	2,503	9,866	181,482	79,357	90	3,050
Mar. ..	1,946	3,760	167,195	126,008	200	821
April..	622	2,236	142,145	121,030	1,128	94
May ..	1,747	232	138,356	149,214	5	—
June ..	398	1,021	126,330	137,186	125	2,037
July ..	1,070	4,806	142,702	75,634	120	2,520
Aug. ..	511	284	111,073	96,368	3	2,000
Sept. .	2,161	2,091	115,464	140,323	—	710
Oct. ..	1,511	1,126	192,361	239,814	147	1,513
Nov. . .	182	26,032	113,181	151,485	14	70
	15,107	53,643	1,553,231	1,392,143	2,695	13,642

## PUBLICATIONS RECEIVED

*Report on the Competition of Industrial Designs, 1933.* Royal Society of Arts, John Street, Adelphi, London, W.C.2.

*A Short Course in Elementary Meteorology.* By W. H. Pick, B.Sc. Meteorological Office, M.O. 247. London: H.M. Stationery Office, W.C.2. Price 2s. 6d. net.

*L'Aviazione Civile attraverso il Mondo.* Ministero dell' Aeronautica, Rome. Price L. 10.

## PATENT AERONAUTICAL SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motors (The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

### APPLIED FOR IN 1932

Published December 28, 1933

- 14,936. E. F. BOUR. Trailed and suspended landing-stage for aircraft-carrying ships. (402,406.)
- 18,594. R. G. READ. High-lift wing section. (402,514.)
- 36,326. FAIRY AVIATION CO., LTD., and A. G. FORSYTH. Induction and lubrication systems of i.c. engines. (402,602.)

### APPLIED FOR IN 1933

Published December 28, 1933

- 6,328. J. P. L. CHEVALIER. Landing-grounds. (402,632.)
- 8,958. AVIONS C. T. WEYMANN. Aeroplane rudders. (402,645.)
- 13,750. BLERIOT-AERONAUTIQUE. Apparatus for fixing tubular rivets. (402,671.)
- 14,415. R. J. MINSHALL and BOEING AIRPLANE CO. Retractable landing-geers and brakes for use in conjunction therewith. (402,675.)

# Personals

## PREPAID

(18 words or less 3/6, then 2d. per word).

### To be Married.

**BALLANTYNE : SEDGFIELD.**—The engagement is announced in Uruguay, South America, between Mr. W. T. W. BALLANTYNE, R.A.F.O., only son of Mr. and Mrs. W. Ballantyne, of High Wycombe, Bucks, England, and PHYLLIS KATHLEEN, youngest daughter of Mrs. Sedgfield and P. Sedgfield, Esq., M.I.M.E., late of the Central Uruguayan Railway.

**LUSK : BILL.**—The engagement is announced between PERCY BUTLER LUSK, R.A.F., youngest son of Mr. and Mrs. R. B. Lusk, of Auckland, N.Z., and CYNTHIA MARGARET, eldest daughter of Major and the late Mrs. Bill, of Farley Hall, Staffs.

**TAAFFE : HOGG.**—The engagement is announced between FLIGHT LIEUTENANT R. T. TAAFFE, R.A.F., second son of the late Capt. Taaffe and Mrs. Taaffe, of Smarmore Castle, Ardee, Ireland, and Miss DOROTHY HOGG, only daughter of Mr. and Mrs. John S. Hogg, of Northwood, Pinner.

### Married.

**MURRAY : SMITH.**—On December 16, 1933, at St. George's, Hanover Square, FLIGHT LIEUT. JOHN GORDON MURRAY, second son of Mr. and Mrs. R. A. Murray, of Leitchland, Dunoon, Argyllshire, to Miss AILSA CATHCART SMITH, daughter of Mr. and Mrs. J. Macpherson Smith, 24, Berkeley Square, W.1.

**DAVY : OAKLAND.**—On December 15, 1933, at Wombwell, Yorkshire, EDWARD JONATHAN PALGRAVE DAVY, R.A.F., to MARY OAKLAND.

**WATT : TAWNEY.**—On December 16, 1933, at the Chapel of the Holy Angels, Lilliput, Parkstone, FLYING OFFICER CHARLES ALPINE WATT, R.A.F., to MARY LAURENCE, daughter of Captain and Mrs. L. A. Tawney, of Ballarat, Parkstone, Dorset.

### Births.

**GRIGSON.**—On December 13, 1933, at Wynberg, Woking, to MARY (née Sayle), wife of SQUADRON-LEADER J. W. D. GRIGSON, R.A.F., D.S.O., D.F.C.—a son.

**TWEEDIE.**—On December 13, 1933, at Purley, Surrey, to SHEILA, wife of FLIGHT LIEUT. P. G. TWEEDIE, R.A.F.O., Imperial Airways, Ltd.—a son.

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**F. J. CLEVELAND & CO.,** Chartered Patent Agents, 29, Southampton Buildings, London, W.C.2. Telephone: Holborn 5875-6.

**KINGS PATENT AGENCY, LTD.,** 146A, Queen Victoria Street, E.C.4.—"Advice Handbook" and consultations free. 47 years' references. Phone: Central 0682.

**GEE & CO. (H.T.P.)** Gee Patent Agent for Great Britain, U.S.A., Canada, etc., Mem. Rad. S.G.B., A.M.I. Rad. E., 51-52, Chancery Lane, London, W.C.2 (two doors from Govt. Patent Office). Phone: Holborn 1525. Handbook Free.

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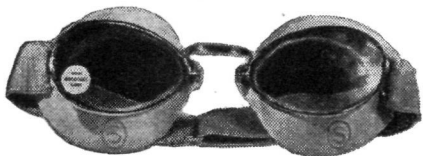


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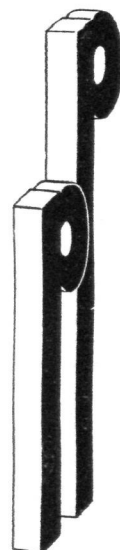
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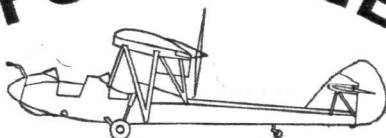
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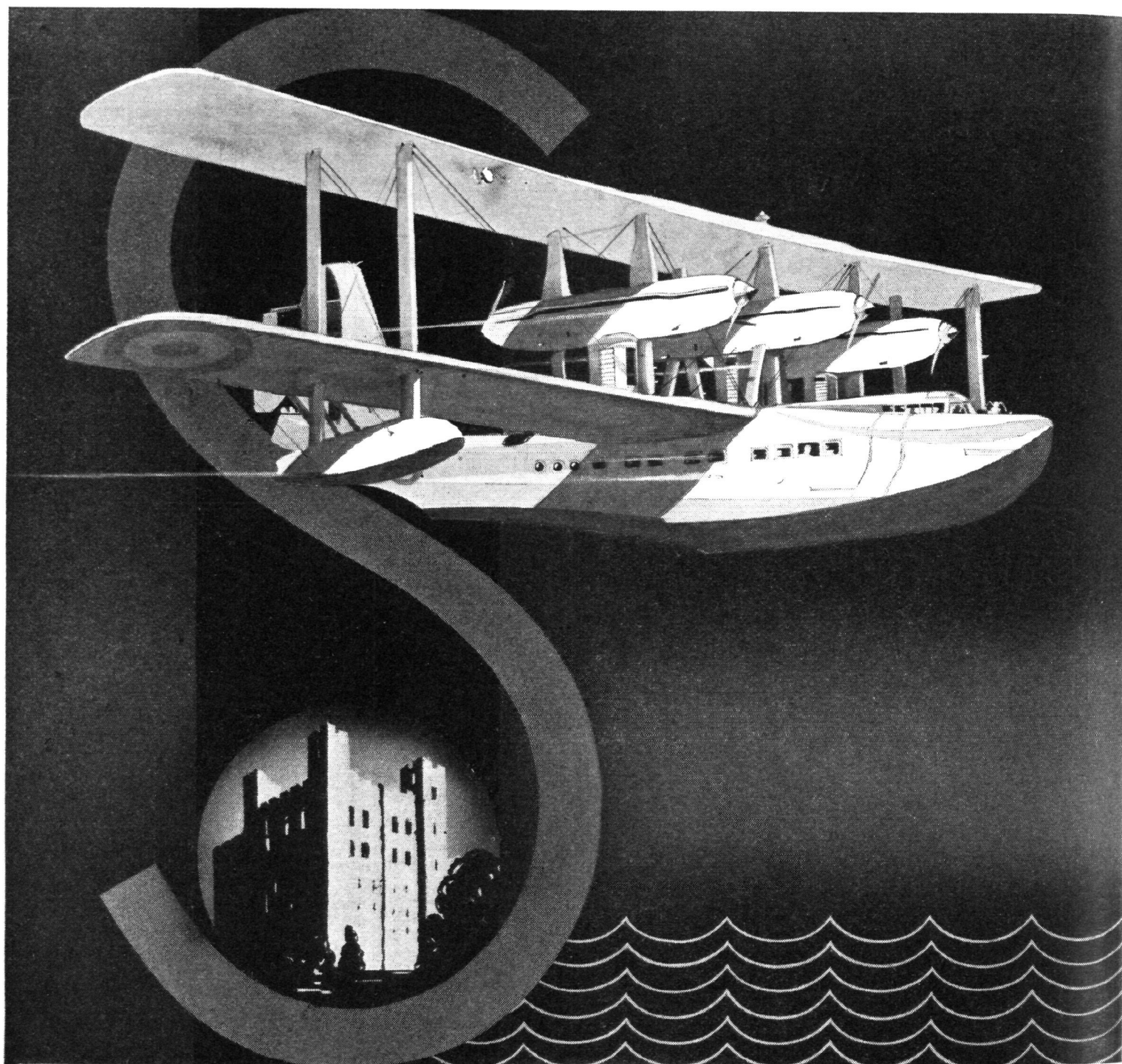
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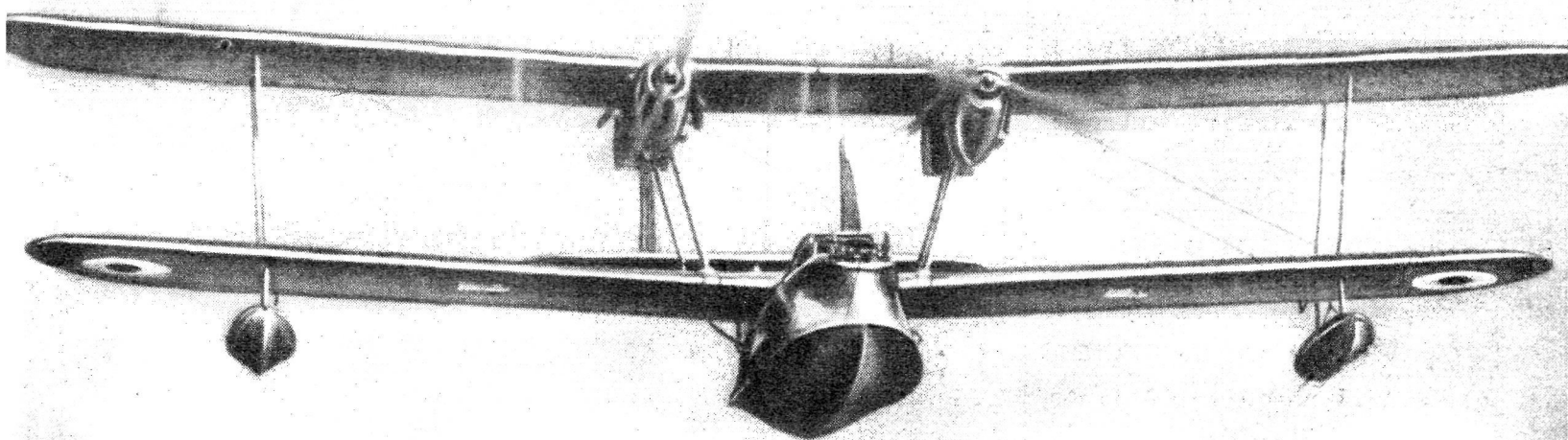


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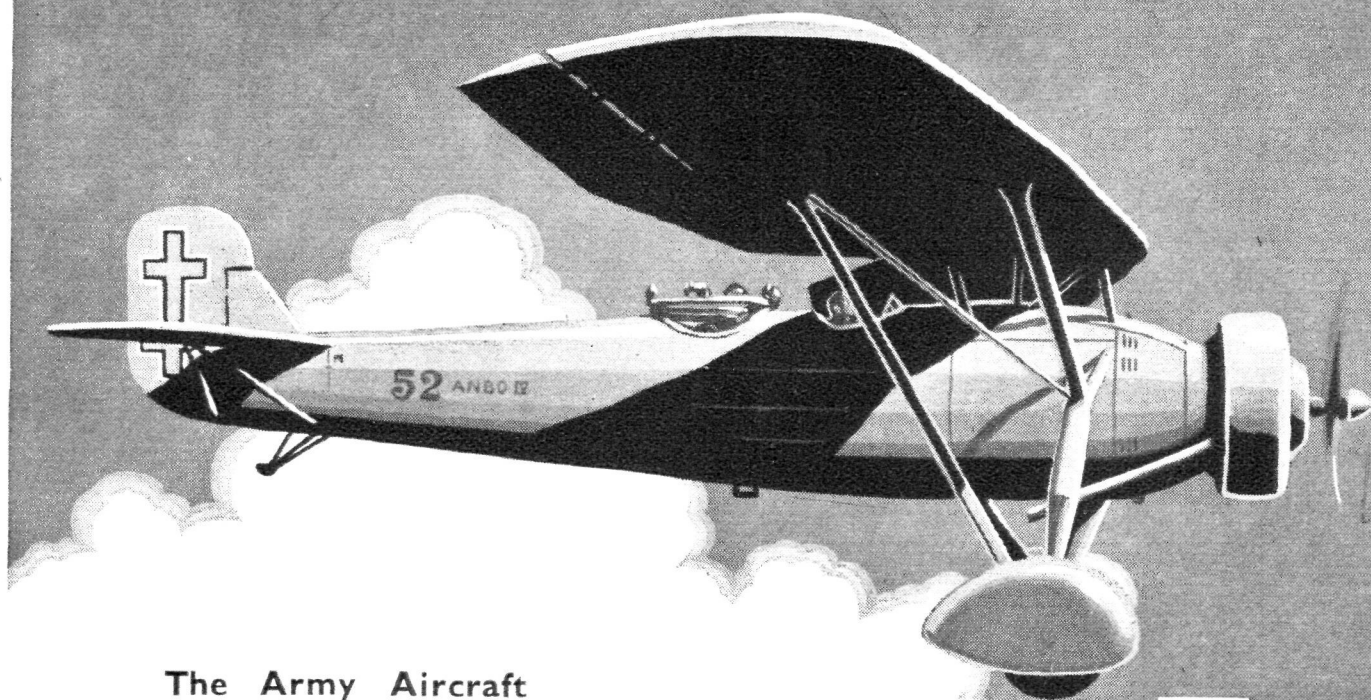
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